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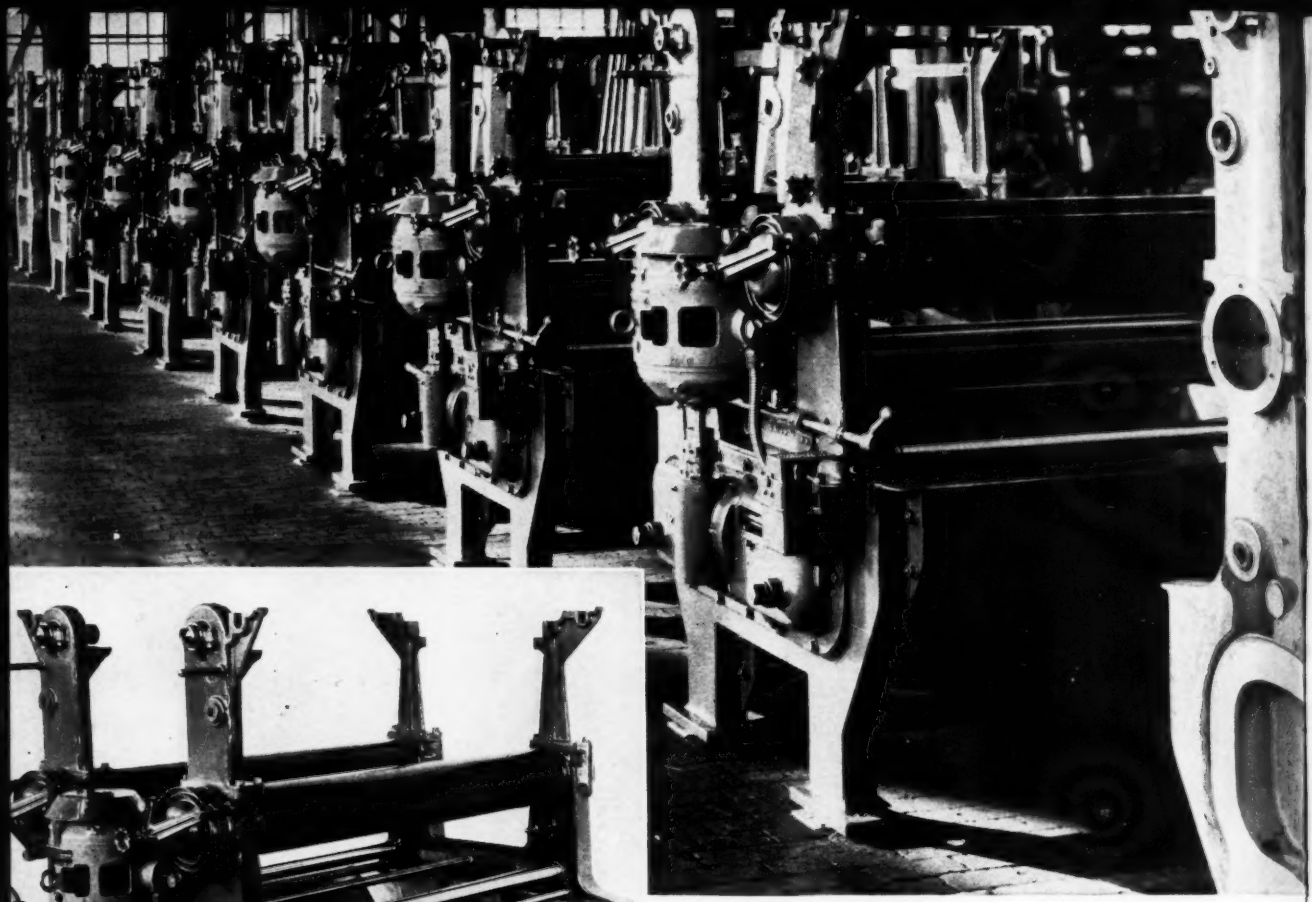

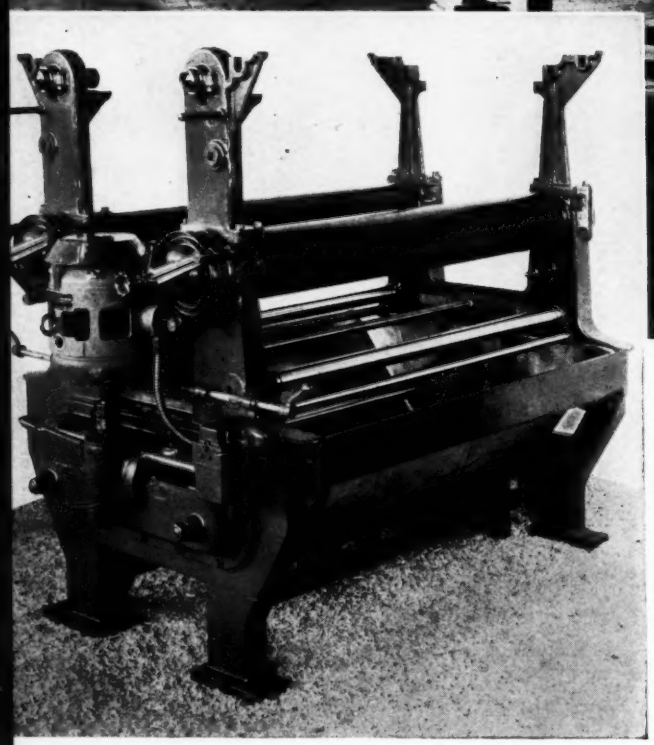

*Unretouched photographs. Above: A battery of Van Vlaanderen Tensionless Dye Jigs shown during assembly. Left: Close up of this jig showing sturdy construction.*

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# AMERICAN DYESTUFF REPORTER

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AMERICAN
DYESTUFF REPORTER

VOLUME 26 SEPTEMBER 20, 1937 NUMBER 19

## Scouring, Dyeing and Finishing

# Automobile Headlinings

WM. F. DEADY

SEVERAL months ago a meeting was held in Boston to discuss automobile fabrics and the importance of uniform shade matching in this line of work. Representatives from practically all the New England automobile fabric manufacturers were present, and a representative from one of the well known automobile body builders gave an interesting talk, explaining the methods used by his concern in cutting and fabricating textile materials for use in upholstering automobile body interiors. He also explained the difficulties experienced by the body builders when they received off shades from the cloth manufacturers. He had with him many samples taken from recent lots received by his firm showing a great variety of shades, which were supposed to match standards set up by his company. Many of the samples could be called good commercial matches such as every dyer experiences in his day to day matching, but there were as many more that should have never left the dyehouse. No doubt some of the latter goods had given trouble and were shipped as is, rather than rehandled for fear of spoiling them entirely.

The body-builders are reasonable in accepting most shades as they realize it is impossible to achieve perfection, but in a business geared to mass production such as theirs, standardization and uniformity in raw materials is a great asset. Trying to use off-shade goods and keep track of them throughout the fabricating process is an expensive proposition with them as was explained in detail.

When the speaker finished there was a general discussion as to the causes and probable remedies for such off-shade work. Some blamed the stock used in the manufacture of the cloth, some blamed the speed required to make deliveries, some stressed the low prices received for the work, some claimed they did not experience such trouble with off-shades from the clothing and allied trades, and of course a few claimed they had no trouble in making perfect deliveries. This discussion certainly brought out many points that had merit and it also acquainted the cloth maker, the dyer and the finisher with the problems of the man who uses the cloth that they turn out. An exchange of ideas in this manner is good for any industry.

A point which was not mentioned, but nevertheless is quite true, is the fact that some manufacturers either through price cutting or good salesmanship obtain orders for this type of work, when really they are not properly equipped to handle it. In many such cases the dyer is blamed for not being able to produce saitsfactory matches and speedy deliveries, when in reality he is licked before he starts by his unsuitable equipment or the equipment of the mill in general.

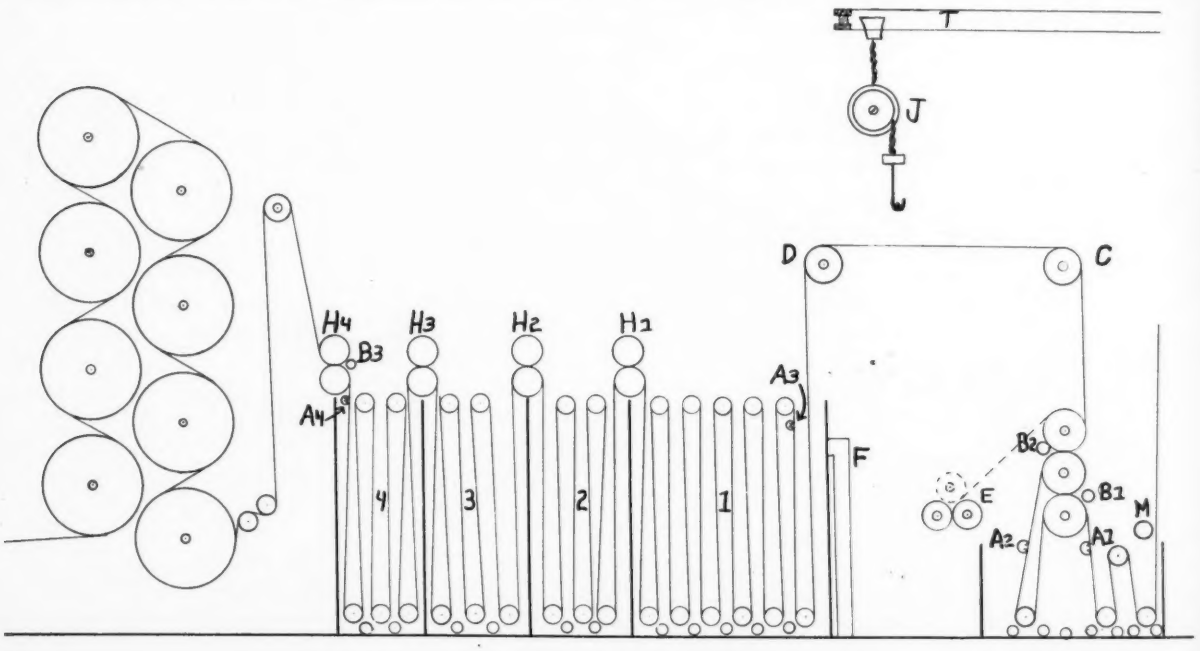
In the automobile fabric business several different types of materials are used for various purposes, and also different qualities by the different body and automobile manufacturers. The bulk of the material may be classified as body cloth and headlining cloth. The body cloth is generally made from wool or wool and cotton mixtures, while the headlining cloth is generally made from cotton. The former is used in upholstering the seats and interior side walls. The latter covers the ceiling. Having had more experience in handling the headlining cloth I will endeavor to explain a process and a machine for preparing and dyeing this type of fabric continuously which I believe will give results satisfactory to any of the automobile body manufacturers.

First let me describe the machine because it is used for the desizing, the scouring and the dyeing of the cloth, and consists of an emersion padder, a set of wash boxes and a set of drying cans all in tandem. The padder is of the three bowl type with two medium rubber covered rolls 72" in length and 16" in diameter. The center roll is covered with hard rubber and is the same length and diameter. Attached to the shaft of this roll is a drive pulley five feet in diameter with a six inch face and is driven by a separate motor equipped with a pullmax. The power is controlled by push buttons on either side of the pad and a speed adjusting rheostat overhead. This motor is hooked up with a second motor which drives the rest of the machine but either one can also be run separately.

The rubber rolls are crowned about one sixteenth of an inch to insure uniform shade from side to center of the dyed goods. The pad box is large enough to allow for two dips in the front and one dip in the back. The padbox and the guide rolls are preferably made of stainless metal, in fact all the guide rolls, spray pipes, suction pipes, drying cans, feed tanks and steam coils in the machine will last longer and give better satisfaction if constructed from this metal. The first cost may appear high but when figured over a period of time the savings from replacements, cleaning and better work will more than offset the extra cost. Referring to sketch, A1 and A2 are suction pipes, B1 and B2 are hot water spray pipes, the hot water being formed by injecting steam into the cold water pipe, M is the spray feed pipe from the feed tanks, E is a two roll batcher, C is a driven guide roll and D is a movable guide tension roll. J is a chain falls running on track T, which in turn circles around the pad and extends back to several benches used for treated cloth roll storage. F is an overflow, A3 another suction pipe and H1, H2, H3 and H4 are pairs of rubber nip rolls 72" long and 12" in diameter. Before each set of nip rolls and at the entering end of the dry cans is placed a set of conical spreaders to prevent wrinkles or double edges from entering the nip. The top rolls in No. 1 wash tank are driven to keep tension to a minimum. Two sets of feed tanks are used, one set connected to the pad box and to No. 1 wash box, the other set connected to No. 2 and No. 4 wash boxes. The pad box is heated by a steam coil with thermostatic control. No. 1 wash box also has a steam coil and an auxiliary direct steam pipe to speed up the boiling-up time. The other wash boxes are heated by direct steam. The dry cans must have sufficient capacity to dry heavy cloth. Between the nip at No. 4 wash box and the drying cans is an adjustable tension bar. Inasmuch as this machine is rather expensive to build every possible means is used to cut down cleaning time, break downs and all unnecessary stoppage so the maximum amount of yardage may be turned out. To cut down power consumption and at the same time reduce tension and make the entire machine more flexible, ball bearings are used wherever possible.

The desizing and scouring operations which require no special technical skill are run during the night, while the dyeing which does require considerable skill is carried on during the day. The goods come from the gray mills in rolls of about 500 yards and are wrapped in burlap. They average about 60 inches in width, but of late inquiries have been made as regards the possibility of handling even wider goods. The machine described above will handle goods almost up to its full width, because after they have been wet out during the desizing and pulled during the scouring, they become much narrower and when ready for dyeing no trouble will be experienced as far as width is concerned.

The processing of the goods may be described as follows. After removing the burlap wrappings the goods are run through a ½ per cent diastase solution made slightly acid with hydrochloric acid. It also is advantageous to add some wetting out agent to insure rapid penetration. The solution in the pad box is kept at a constant level by feeding an amount equal to that taken up by the cloth from the feed tanks. Temperature is kept uniform by the thermostatic control of the steam coil. After passing through the padder the goods are rolled up on batcher E. Two gray mill rolls are made into one roll on the pad. Seams are carefully watched and sewed with a Merrow wide stitch machine. The heavy treated roll is then lifted off the batcher with the chain falls J and swung out and around the pad and placed on a storage bench in



front of the pad. The chain falls runs on a track T. A light set is maintained on the padder to insure sufficient solution being retained in the goods, and the rolls are turned every so often to prevent seepage to the bottom. The rolls are allowed to stand on the bench until the sizing starches are converted into soluble sugars, or until the lot is all treated. In this process the machine is run at 60 yards per minute. (Only the padder is used during this operation.)

The treated rolls are then taken in rotation, lifted from the bench by the chain falls to the pad. Hot water replaces the diastase in the pad box and the goods are so threaded that they pass over the suction pipes A1 and A2. At B1 and B2 hot water is sprayed on them at the nip. A heavy nip is used at this point and by this arrangement of sucking, spraying and tight squeezing a very efficient washing is given the goods. The suction system is connected to a rotary suction pump of sufficient size to maintain at least 15 inches of vacuum at all times.

Instead of batching the goods up this time they pass up over the driven roll C, then over tension roll D and down into No. 1 wash box. Overflow F is closed and a solution of boiling caustic, soda ash, soap, and pine oil is used to remove the waxes and pectic matter. The strength of this solution is maintained by feeding a strong solution of the same materials from the feed tanks. The temperature is kept up by the steam coil in the bottom of this tank. The next two boxes No. 2 and No. 3 are used for hot water washing to remove the chemicals used in the scouring in No. 1 box. In No. 4 box the goods are treated with a dilute solution of sulfonated olive oil which helps to further soften the goods for napping and also helps in the dyeing.

The goods then pass over the dry cans and are swung into wide box trucks. It is not necessary to bleach these goods as the shades ordinarily dyed on these goods cover the natural cotton color very well. This scouring operation is carried out at a machine speed of forty yards per minute.

The goods are then sent to the napping room where they are given several runs on the napping machine. Only one side of the goods are napped and after napping they are either sheared or singed to remove the long fuzz and strings and produce a more uniform nap. Singeing is cheaper and satisfactory if properly done. If the goods are scorched they may require a second scouring, but if the flame is correctly controlled this second scouring is unnecessary. The less handling the goods receive the better because excessive pulling thins them and also makes it harder for the finisher to get his proper width on the tenter frames.

Now we are ready for the dyeing operation. As a general rule sulfur colors, owing to their all-round fastness and low cost are used. They also have an advantage in continuous dyeing due to their slow exhaustion and ability to dye unbleached cotton very well. A word may be said at this point on the selection and control of the dyestuffs for this type of work. Much work can be done in the laboratory in selection of the proper dyestuffs. Tests for shade, fastness and speed of exhaustion can be made, and from this information the dyer can run trials on the machine and plot a set of curves for each dye showing the exact amount of dye to feed in relation to the amount of dye in his pad box to maintain a uniform shade during the run. A set of these curves carefully made are as valuable to the dyer as a good set of charts are to the mariner.

In patching for shade a few yards of the napped goods are sewed onto a leader and the formula for the pad box only is made up. The sample is then run through the entire machine and a patch taken from it at the delivery end of the drying cans. It is cooled off and compared with the standard. If it is not on shade the dyer makes the necessary correction in his formula, compensating for the amount of dye taken out of the pad box by the leader. After the addition or other change is made, a second sample is run through in the same manner as the first, in fact this sampling is kept up until the dyer has arrived at the proper match for the standard. When a match is secured the dyer takes this pad box formula and after consulting his plotted curves figures the amount of each dyestuff he will need to make up the feed liquor. With the feed liquor made up he is ready to start the lot. The routine of the dyeing operation is a little different from the scouring operation previously described.

In passing through the padder the cloth does not contact the suction pipes as they are shut-off and the hot water nip sprays are not used, otherwise it is threaded up the same. The thermostatic control of the pad box liquor is of the utmost importance, as is a uniform well distributed feed. The movement of the cloth keeps this liquor well agitated. Passing through the padder the cloth gets a short skying over C and D and then enters No. 1 wash box where it is washed with cold water. The overflow at F is opened and the suction turned on at A3. This suction may seem unnecessary to the average dyer but no other method will force water through the cloth so quickly and completely and at the same time carry away from the wash water so large an amount of the now unwanted $Na_2S$, $Na_2CO_3$ and other chemicals used in the dyebath. Also at the same time air is sucked through which helps greatly in the oxidation of the dyestuff to prevent further bleeding of the color during the balance of the washing, thereby giving a fuller shade. No. 2 box contains a warm sodium bichromate and acetic acid solution which completes the oxidation and neutralizes the remaining alkali, at the same time the chrome combines with the dye molecule to increase its fastness.

Boxes No. 3 and No. 4 are used to give the goods a hot water wash to remove any excess solution carried over from box No. 2. A suction pipe A4 and hot water spray at the final nip H4 increases the efficiency of the wash. Care must be taken at every point that no rubbing occurs to disturb the napped surface, as it will show badly in the finished goods. The goods are now run over the drying cans and swung into wide box trucks. The goods are given a preliminary inspection as they come over the

dry can swing and patches are taken every few seams to gauge the uniformity of the shade. If the shade according to the patches starts to vary, the machine is stopped and the necessary correction made to bring it back to standard. Sometimes this requires cutting the goods off and re-sampling and the off-shade part kept one side to be topped up to the standard later. The dyeing speed is 60 yards per minute.

Other types of fabric such as backing for artificial leather, raincoating, linings etc. may be dyed on this unit as well as other types of colors. By inserting a dam type pad box on the bottom roll even light shades and light fabrics may be run and batched up at E as the pad may be operated independent of the rest of the machine. Vat colors either pad-jig method or dyed continuous similar to the sulfur method just described may be also run.

After the headlinings are dyed and passed by the dyer as to shade and quality they are sent to the finishing department. Here they are run through a combination starch mangle and tenter frame. In this operation they are waterproofed (if called for) and starched to give them just the right stiffness to aid the body builder in his cutting and sewing operations. On the tenter frame they are dried and pulled out to the required width. At the delivery end of the frame they are batched up on rolls.

The finished goods are then run over a combination winder and inspecting machine where they are given a final inspection. Seconds and spoiled goods, if any, are removed and the perfect goods wound on tubes, each piece on a separate tube. These rolls are then stacked upon an inclined shading board with the loose ends hanging out. Here the shader looks them over, and checks each roll with the standard shade. Any variations he marks generally with letters such as shade A, shade B, etc. The various shades are then grouped together and packed separately, and after billing are ready for shipment. Any goods that are not suitable to be classed as firsts, may many times be rehandled in either the finishing department or the dyehouse, depending upon just what was wrong with them, and first quality merchandise made out of them. Of course there are times when rehandling is not advisable.

In summing up the advantages of the machine and process described, let me say that the machine is designed as a unit, to conserve floor space, reduce construction costs, and keep operating cost down to a minimum. Allowing the padder to be run separate from the rest of the machine, and carrying on the scouring operations at night, saves the expense of a supplementary wetting out pad. In fact the diastase treatment can be speeded up to 120 yards per minute and excellent results obtained. This averages up pretty well for the slower speed advised for scouring proper.

By batching the goods on a roll after treating with the diastase, the sizing starches are more uniformly solubilized and removed, because the roll holds the heat and the solution longer and more evenly than if the goods were put into box trucks. Also there is no chance of air stains, box marks, creases or double edges while on the roll. These faults are liable to show up after the goods are dyed. As the cloth is wet at this point it is much easier to keep it centered on the machine, than if it was pulled out of a box.

The combination of vacuum sucking, hot water spraying and heavy squeezing, thoroughly removes the sizing and loose dirt, so that the scouring chemicals go to work at once on the waxes and pectic matter in the cotton. Even though the scour is of short duration it is ample to insure even dyeing and good penetration, as it is not advisable to kier boil the goods, or put them in rope form at any time. The only other method would be to scour on jigs which is more expensive and more liable to produce uneven results.

Napping and singeing or shearing before dyeing give the finished goods a better appearance, insures better dye penetration and a fuller shade. Ball bearing guide rolls, carefully synchronized nip rolls and proper working tension compensators, reduces the tension on the cloth, which in turn, prevents cracked selvages, broken seams, (with the possibility of stripping the machine), and allows for a fuller feel to the goods after finishing. Rub marks and wavy or chattered appearances of the napped face of the goods are also eliminated. In the dyeing proper, foam stains, dye stains, lint marks, and water spots are watched carefully and taken care of as in any well regulated dyeing method.

Consequently with uniform desizing, uniform scouring, carefully selected dyestuffs, and curves scientifically plotted, to guide the dyer in their control, on a machine that is thoroughly equipped for the job, the automobile body builder should get the product that he desires. That is, yardage in volume with the least amount of shade variations.

*Watch for the Second*

**QUARTERLY RESEARCH REPORTS NUMBER**

*to appear in the Proceedings of the American Association of Textile Chemists & Colorists as published in the October* 18, 1937 *issue of the*

**AMERICAN DYESTUFF REPORTER**

# Physical and Chemical
# Textile Testing - II

JOHN H. SKINKLE*

## PART I—PHYSICAL TESTING

*(Continued from September 6, 1937 issue)*

### CHAPTER 3—FIBER TESTING

#### Staple

Staple is the length of a textile fiber, but as commonly used means the average length of a sample of fiber. Staple is usually associated with the grade of the fiber, because the same person usually determines both qualities; there is, however, a distinction between staple and grade which is important in testing because one is measurable and the other is the expression of opinion of an expert and not measurable by a non-expert. "Grade" as used to describe a textile fiber is a summation in the mind of the person examining the material of the color, handle, evenness, staining and fineness of the fiber; this summation can be learned only by long experience and comparison with standards, the results however seems to be quite definite because expert graders working independently will nearly always arrive at the same result.

**TABLE V**
**Standard Grades of Fibers**

| *Standard Grades of Cotton* |
|---|
| 1. Fair (best grade) |
| Barely Fair |
| Strict Middling Fair |
| Fully Middling Fair |
| 2. Middling Fair |
| Barely Middling Fair |
| Strict Good Middling |
| Fully Good Middling |
| 3. Good Middling |
| Barely Good Middling |
| Strict Middling |
| Fully Middling |
| 4. Middling (standard) |
| Barely Middling |
| Strict Low Middling |
| Fully Low Middling |
| 5. Low Middling |
| Barely Low Middling |
| Strict Good Ordinary |
| Fully Good Ordinary |
| 6. Good Ordinary |
| Barely Good Ordinary |
| Strict Ordinary |
| Fully Ordinary |
| 7. Ordinary (poorest grade) |

| *Standard Grades of Japanese Raw Silk* |
|---|
| Crack Double Extra |
| Double Extra |
| Extra |
| Best No. 1 to Extra |
| Best No. 1 |
| No. 1 |
| No. 1 to 1½ |

| *Standard Grades of Wool and Wool Top* | |
|---|---|
| American Grades | English Grades |
| Fine | 80's, 70's, 64's |
| ½ Blood | 60's, 58's |
| ⅜ Blood | 56's |
| ¼ Blood | 56's, 48's |
| Low ¼ | 46's |
| Common | 44's |
| Braid | 40's, 36's |

Table V gives the standard grades for cotton, wool, and silk. Cotton has seven grades ranging from Fair which is the best grade to Ordinary which is the poorest grade. The half grades are designated by the prefix "Strict," so that "Strict Middling" means a cotton which is one half grade better than "Middling." The quarter grades are designated by the prefixes "Barely" or "Fully"; so that "Barely Middling" is one quarter grade lower than "Middling" and "Fully Middling" is one quarter grade higher than "Middling." Wool has seven grades ranging from Fine (the best) to Braid (the poorest) in the American system. In England the practice of grading recognizes a greater number of divisions, originally based on the finest yarn to be spun from the fiber but now more or less formalized. The fineness of the fiber is the most important factor in grading wool; a microscopic projection method of measuring this fineness has been devised and is in more or less general use. The grading of silk varies with the locality from which the silk comes. The system in use on Japanese silk is given in Table V and consists of seven grades ranging from "Crack Double Extra," which is the best, to "No. 1 to 1½," which is the poorest. The grading of fibers should not be attempted by the ordinary tester but should be left to an expert; the tables are given so that the meaning of the terms reported may be understood.

Stapling, on the other hand, is an art which may be fairly easily learned, the following methods being in general use:

1. Hand stapling
   a. Cotton
   b. Wool
2. Machine stapling
   a. Ball
   b. Baer
   c. Suter-Webb

Hand stapling of cotton can be readily learned by observation, or from the following directions as given by the U. S. Department of Agriculture:

1. Grasp in the two hands a tuft of cotton of a size convenient for the purpose (about ¼ of an ounce), holding it firmly between the thumb and forefinger of each hand, with the thumbs placed together, the fingers being turned in towards the palms of the hands, and the middle joints of the second, third, and fourth fingers of each hand touching the corresponding joints of the fingers of

*Department of Chemistry, Lowell Textile Institute, Lowell, Massachusetts.

the other hand, so as to give a good leverage for "breaking" the cotton.

2. Pull the cotton slowly apart with about the same leverage of each hand on the joints of the fingers, separating the tuft of cotton into two parts. Discard the part remaining in the right hand.

3. Grasp with the thumb and forefinger of the right hand, the end of the tuft of the cotton retained in the left. The point of pressure on the cotton in the left hand is just below the joint of the thumb and at the nail joint of the forefinger. With the right hand draw a layer of fibers from the cotton held in the left hand. Retain in the right hand the layer so drawn.

4. Repeat this operation four or five times, placing each successive layer directly over the fibers previously drawn, using care to see that the ends of all the layers are even with each other between the thumb and forefinger of the right hand.

5. After discarding the cotton in the left hand, hold the fibers thus obtained between the thumb and forefinger of the right hand and smooth them with the thumb and forefinger of the left hand. Place these fibers on a flat horizontal surface with a black background.

6. Block off the ends of the fibers with a cotton stapling rule so as to indicate the length of the bulk, or body, of the fibers. Then measure the distance between the blocked-off ends.

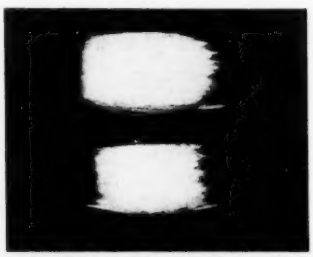


**Fig. 11—Cotton Staple—Hand Method**

Figure 11 shows the results obtained by this method on two samples of cotton. The result is, of course, the average staple of the cotton and does not give any idea as to the number of fibers of each length.

In the stapling of wool, it is necessary to get some idea of the distribution of fiber lengths as well as the average staple; in the case of wool, also, we have longer fibers which are easier to handle singly or in small numbers. Wool stapling therefore consists of laying out all the fibers from a sample on a proper background in order of their lengths. The steps in stapling a sample of top are as follows:

1. On a piece of black velvet, mounted rigidly on a board, draw a chalk line for a base.

2. Square up the end of the top by pulling out the loose fibers.

3. Grip the square end of the top between the thumb and forefinger of the left hand and pull out a tuft of fibers free from the rest of the top, being careful not to break fibers. This new end will be long and tapering.

4. Transfer the square end to the right hand and very slightly twist together the longest fibers in the tapering end.

5. Place the top of longest fibers on the chalk line, hold with one finger of the left hand and slowly pull the main tuft away with the right hand, at right angles to the base line. The fibers should cling to the black velvet.

6. Repeat with the next longest fibers, alongside the first set, and continue until all the fibers are on the velvet. Try and get a uniform density of fibers throughout. Figure 12 shows a sample of ½ blood wool which has been stapled in this manner.

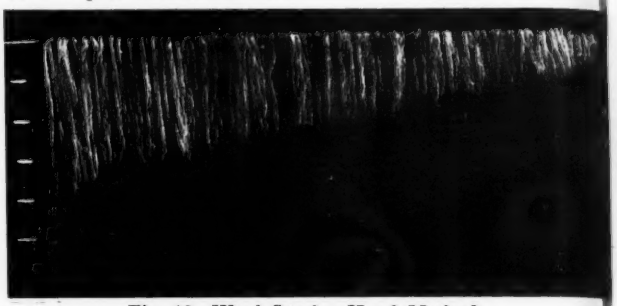


**Fig. 12—Wool Staple—Hand Method**

For ordinary mill routine, the average length of staple is determined by placing a rule parallel to the base line and in such a position that there is as much long fiber above as short fiber below. This average length is read, also the longest length. For a somewhat more accurate determination of average staple, a tracing of the fiber layout may be made; the area measured with a planimeter and divided by the length of the base would then be the average staple. A still more accurate method would be to take all fibers between certain length measurements and weigh them, repeating this operation for the same length interval all down the array. The average length of each group times the weight of the group would then be determined, these products added up and divided by the total weight of the sample would give the average staple.

The wool stapling method gives much more information than the cotton stapling method but it is difficult to carry out the process by hand on cotton, therefore machines have been devised which will considerably assist in the process; these machines do not, however, completely eliminate the human factor. The three types of machine staplers are the Ball (or sledge) machine, the Baer, and the Suter-Webb. The Ball apparatus is applicable only to sliver and requires a large sample, it is not used to any great extent in this country. The Suter-Webb is simply an elaboration of the Baer; in fact two Baer instruments may be used instead of the Suter-Webb. The Baer is the most common instrument and the one whose operation will be described.

The Baer apparatus consists essentially of a metal frame holding nine bottom combs, pointing upward, hinged at one end and held by a pin at the other so that they may be dropped one at a time; in slots at the top are three top combs, pointing downward, which are removable. Accessories with the apparatus are a pair of wide nose tweezers, a wooden rake for pressing fibers into the combs, a

needle for straightening fibers, and a transparent scale for reading the fiber diagram. The method of use on a sample of cotton is as follows:—

1. From the sample pull fibers as in hand stapling until a good sized tuft about 2½ inches long is obtained. Straighten the fibers as much as possible but do not discard any. If fibers are very dry, moisten by breathing on them.

2. With the top combs removed and the sorter with back toward the operator, place the sample on the combs at the right side so that the fibers project about an inch from the needles. The end of the projecting tuft should look like the end of a water color brush; i.e., bluntly tapering.

3. Using the tweezers, grasp the ends of the outermost fibers and draw them from the combs. Draw through the back comb to remove dirt or straighten.

4. Place these fibers on the combs at the opposite end of the sorter, with the tweezers against the nearest comb. Release the tweezers carefully and press the fibers into the pins with the wooden rake. The fibers should be in a narrow band.

5. Repeat this drawing, placing the fibers on this band, until all the projecting fibers from the first tuft are gone.

6. Put in the top combs, turn sorter around so that it now faces the operator, draw a straight chalk line on the velvet covered plate as a base line. If no fibers project from the nearest comb, lower the combs one at a time until fibers do project.

7. With the tweezers, grasp the longest fibers near the ends and draw from the combs. Keep these fibers straight.

8. Place the lower front edge of the tweezers on the left end of the chalk line. If any fibers are not straight, use the needle to straighten them. Release the tweezers and withdraw them carefully, holding the fibers with the needle.

9. Repeat these operations, dropping the lower combs and removing the top combs as necessary. Place each new tuft of fibers at the right of those already drawn so that a uniform thickness of fibers is obtained.

10. Place the transparent scale on the array and read off the values desired, or make a tracing of the array, or weigh groups of fibers as described in the stapling of wool. As an approximation, the average staple is the staple about ¼ of the way along the array.

Figure 13 shows a Baer diagram of comber sliver and comber waste. Diagrams such as these are very valuable in analyzing the efficiency of textile machinery.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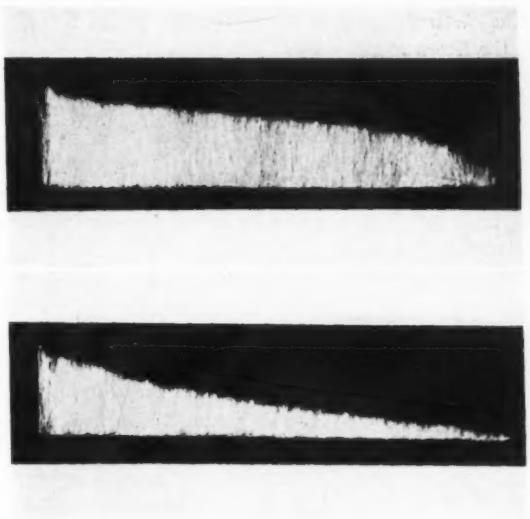

**Fig. 13—Cotton Staple—Baer Sorter Comber Sliver and Comber Waste**

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## Hair Weight

Hair weight, or more correctly hair weight per unit length, is a means of expressing the fineness of a fiber. Various units have been used, such as ounces $\times 10^{-6}$ per inch, milligrams per inch, milligrams per 10 meters, and milligrams $\times 10^{-5}$ per centimeter; this last method of expression seems to be the most commonly used and the one to which reference will be made in this discussion.

Two methods may be used for determining fineness of fibers—measurement of diameter or measurement of hair weight. The measurement of diameter is done by a microscope and graduated wedge; this is considerably used of late years in the determination of the quality or grade of wool, but in the case of cotton is not of much value because of the fact that cotton is a hollow fiber, so that the properties of cotton depend not only on its width but also on the proportion of that width which is solid fiber and not air space. The hair weight method, on the other hand, gives an accurate estimate of the amount of material in a fiber which is much more nearly correlated to other fiber properties than diameter measurements of cotton; the disadvantages of the hair weight method are the facts that the method is time consuming, requires considerable skill on the part of the operator, requires a microbalance, and gives an average result with no information as to the distribution of different sizes of fibers. Diameter measurements, then, are used principally on wool, and occasionally on cotton; hair weights are determined principally on cotton, occasionally on wool. As a matter of fact, hair weights are seldom obtained for routine work, even on cotton, but only in research work or in trouble-shooting.

There are three methods of determining hair weights: Clegg's method for use on cotton, Winson's method for use on wool, and the A.S.T.M. method used principally on cotton but which could be used on any type of fiber.

Clegg's method consists of taking cotton which has had the fibers more or less parallelized either by a machine sorter or by hand stapling, and cutting from the middle of the bundle of fibers with a special cutter consisting of a holder with two safety razor blades exactly one centimeter apart. About 200 pieces of hair are then weighed on a quartz fiber torsion microbalance; the zero of the balance must be checked often or the fibers weighed by the null method, that is, a one milligram weight is placed on the balance, the deflection read, and enough fibers put on the balance to give the same deflection. The cutter should be tested at intervals by marking on a glass slide covered with wax and measuring between the marks. No special care is necessary to obtain average lengths of fiber as there is apparently very little correlation between fiber length and hair weight. Groups of fibers from the Baer diagram may be used for samples and the results averaged. Table VI gives Morton's results on various types of cotton.

**TABLE VI**
**Hair Weights of Fibers**

| *Wool* | | *Cotton* | |
|---|---|---|---|
| *Quality* | *Hair weight per cm. at 13.6% regain mgms. x $10^{-5}$* | *Variety* | *Hair weight per cm. mgms. x $10^{-5}$* |
| 80's | 447 | Egyptian | |
| 70's | 485 | Sakel | 113-151 |
| 64's | 580 | Assili | 144-170 |
| 60's | 690 | Uppers | 177-212 |
| 58's | 771 | American | |
| 56's | 919 | Sea Island | 102-136 |
| 50's | 1123 | Texas | 167-211 |
| 48's | 1260 | Miscell. | 178-235 |
| 46's | 1290 | South American | 165-256 |
| 44's | 1468 | Indian | 193-312 |
| 40's | 1560 | Indian-American | 145-226 |
| 36's | 1512 | African-Amer. | 135-180 |
| | | American-Egypt | 167-175 |

Winson's method, used on wool, consists in sampling the top as for staple, parallelizing the fibers by hand and cutting a section out of the bundle of 3 or 4 centimeters in length, using a rule or better a metal gauge. From this bundle is counted out 500 to 700 fibers which are rolled together in a small bundle, washed in two changes of benzene, rinsed in two changes of water, dried, and weighed. A small sample (about one gram) of the original wool is put through the same treatments and the moisture determined on this sample. There is considerable correlation between the staple and the hair weight of wool, so that an average sample should be cut. The resulting hair weight is calculated to standard regain. Table VI gives Winson's values for the standard wool tops, recalculated to 13.6% regain and converted to milligrams x10-5 per centimeter.

The A.S.T.M. method consists in taking a number of fibers from an eighth inch group of the Baer diagram, weighing, and calculating the hair weight. For example, if 100 fibers from 1-1⅛ inches in length (average length= 17/16 inches) weighed 0.54 milligrams, then the hair weight would be

$$\frac{0.54}{\frac{17}{16} \times 2.54 \times 100} = 200 \text{ mgms x } 10^{-5} \text{ per cm}$$

where 2.54 is the number of centimeters in an inch.

As shown in Table VI, hair weights might be used to determine the quality or grade of wool provided that the fibers are not excessively medullated; diameter measurements are more convenient, however. Table VI also gives the hair weights for various types of cotton, there is considerable overlap, however, so that the method is not especially valuable for positively identifying a sample of cotton; the method will, however, show a difference between two cottons which might have the same staple. Hair weight will also give information as to the maturity of the cotton, a high hair weight indicating more mature cotton, a low hair weight of the same cotton indicating immaturity. Here again, however, more convenient microscopic methods are available for determining the maturity of cotton—the swelling method, and the polarized light method. A close correlation between the hair weight of cotton and the strength of the yarn spun from the cotton has been observed.


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## Resilience

Resilience is the springiness of a mass of fiber or the ability of the fiber to come back to its original volume after being compressed. This property is especially valuable in such fibers as cotton, kapok, or hair which are used in mattresses; it is also an important factor in the "feel," "handle," or "loftiness" of fabrics; it is also important in such fabrics as necktie linings which are often crumpled. The resilience of fabrics will be taken up later when we consider the stiffness and creasing properties of cloths, and at this time we will consider the resilience of fiber masses.

The principle of resilience measurement is the hysteresis of the load-volume curve; that is, if we apply a load to a

mass of fiber and measure the volume, increasing load will cause a decrease in volume; if we then unload the mass, the volume will increase, but will not follow the same curve as increasing load; the difference between the two curves is a measure of the resilience, a small difference indicating a high resilience and a large difference indicating a low resilience. Two methods have been devised—the rubber balloon method of Winson and the cylinder and plunger method described by Haven.

Winson's apparatus consists of a rubber balloon which holds the fiber and which is enclosed in a glass vessel; both the glass vessel and the balloon are connected to a mercury manometer and to a three-way stop-cock by means of which either one or both may be connected to a filter pump or to the atmosphere. The apparatus is first calibrated, then run with fiber in the balloon; the balloon and vessel are both evacuated, then air is admitted to the vessel but not to the balloon, this applies a load to the fiber mass which is measured by one manometer, the result is a decrease in volume which is measured by the other manometer. Winson used this method to measure the resilience of wools and found the results correlated well with expert judgment. Short fibers were found to be more resilient than long ones. A planimeter was used to measure the area of the hysteresis loops.

Haven has described a method in use by the United States Federal Specifications Board in which 500 grams of fiber is placed in a hollow brass cylinder 7½ inches in diameter, the axis standing vertically. A plunger is used to compress the material and a vernier is arranged on the screw driving the plunger so that the depth of the penetration may be measured. The screw is simply an inverted jack and the apparatus is coupled to a platform scale to read the load. The time element is important, since on application of a load the volume will slowly change, therefore readings were taken two minutes after application of the load. The resilience may be measured by the area of the hysteresis loop or more simply by observing the displacement on loading and unloading at a given low load with a high loading in between. Haven uses 50 lbs. and 800 lbs. as the two loads. On loading to 50 lbs. the reading is "b", on loading to 800 lbs. the reading is "a", on unloading to 50 lbs. again the reading is "c".

Then Resiliency factor $= \frac{a\text{-}c \times 100}{a\text{-}b}$

Cloth resiliency may be measured in this instrument by cutting out discs of 7½ inches diameter, and separating them with discs of tin.


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***(To be continued)***

# Silk Hosiery Processing*


**L. O. KOONS**


THE problems discussed in this paper are principally those encountered in processing pure silk hosiery (full fashioned and seamless). Some of the methods used to combat them, to correct and prevent damage, are also applicable to other fabrics and fibers, namely, wool, regenerated and acetate rayons, etc.

Most hosiery is dyed in the fabric and when received by the dyer, contains an amount of foreign materials and contaminations, namely, soap, oils (animal, vegetable, mineral or a mixture of them), alkalies, salts, etc., not put there by the silk worm. These materials are added to facilitate previous processings. The average boil-off is about 25 per cent, consisting of 18 per cent to 20 per cent of sericin (silk gum) and 5 per cent to 7 per cent of any, or all, of the materials which I have previously mentioned.

## DAMAGE DUE TO ALKALINE SOLUTIONS

Alkali is the greatest offender, and strange to say, the most often used. Starting with the cocoon, we find it being soaked in a solution of borax, modified soda or an emulsion, the purpose being to facilitate the reeling.

Next, the soaking of silk and it is in this process, where the silk may be damaged to a great extent by alkali. Why? Not intentionally by the throwster, for he must resort to those practices so that the silk will be soft, take water readily and get a uniform fabric free of sleaze (for direct knitting).

Silk in the gum, is quite resistant, even to strong, cold, alkaline solutions, but up to this stage in the processing of silk, everything used on it is retained, and when dried, the water only evaporates, and we get the action of concentrated alkalies, often damaging the fibroin, or true silk. But we are not through yet.

Full fashioned goods are knit wet, that is, the threads are passed through a trough on their way from the cone to the needles. This trough may contain only water, or a neutral emulsion, but frequently, an alkaline one. What happens? In all cases, the water dissolves the alkali on the silk and on drying, the alkali becomes concentrated and duplicates the damaging performance of soaking. On

*Address delivered at a meeting of the Ontario Section, Canadian Association of Textile Colourists and Chemists, held in London, Ont. on April 3rd, 1937.

drying, at an elevated temperature, the damaging action of the alkali is intensified in the above process. It is well known that alkali will tender silk. Small wonder then, that sometimes, it is impossible for the dyer to run the goods in the dyeing machine for even an hour without chafing.

## TWO TONE EFFECTS

Two separate distinct shades in the one lot or foot one shade, leg portion another, are known as two-tone effects. Subjecting silk to various kinds and strength of alkaline solutions and drying the fiber with the alkali on it produces different shades, even when dyed in the same bath, and on subsequent stripping and redyeing this effect remains. This effect is intensified when the alkali is applied to the silk in the gum and dried at an elevated temperature. Further the action seems to continue and the longer the alkali is on the silk, the greater the increase in the absorption of dyestuffs. In other words, the greater the deterioration of the silk, the darker the silk will dye. Of course, we must admit that silks from different localities and different natures, dye differently, but the action of alkalies is one of the principal causes of two-tone effects.

Gentlemen, we have here samples which clearly show you the effect of alkalies on silk, and the results obtained when dyed.

We have a number of laboratory dyeings, to show the results obtained with various alkalies.

Stockings in the gum were spotted with one-quarter per cent solutions of the following alkalies: NaOH, KOH, 1 per cent solution of $K_2CO_3$, $Na_2CO_3$. The hosiery was allowed to dry at room temperature 70-80° F., for a period of 3 days. They were then dyed.

You will note the increase in dye absorption, where they were spotted with alkali.

Another set of stockings treated in the same manner, but force dried at a temperature of 140-150° F., the dye absorption is intensified to a greater degree.

## PREVENTING SPOTS BY USE OF SPLIT-BATH METHOD

In my previous remarks, I mentioned what the silk contained when the dyer receives it. No wonder at times he has trouble with spots. He, naturally, does not know what the silk contains, or, in fact, where it came from. He proceeds along with his usual methods. The first thing you know, he is plagued with stockings which contain millions of little spots, ranging from pin heads to those the size of a silver dollar.

Of the three methods of dyeing,

Boiling-off first

Boiling-off and dyeing in the one bath

and

Split bath method

it is my firm opinion, and it is borne out in practice, that the split bath method gives the most consistent results, better control and fewer spots.

This method requires the same amount of degumming agent, one-half in each bath. The first bath is an efficient scour, it emulsifies any oils that may be in the silk and they are removed when the bath is flushed over. Of course, any other alkalies or soluble salts are also removed in this bath and not carried over into the dyebath.

The second bath in this process contains only one-half the amount of degumming agent, but sufficient to remove all the gum. The bath is milder, gives better control of the dyestuffs and enables the goods to be run longer without being damaged.

## USE OF PROTECTIVE COLLOIDS

I said previously, that alkali was the principal offender and damaging agent to silk; continued boiling also affects it. Today there are available protective colloids, known as Protein decomposition products, which can be added to the dyebath, that minimize both the action of alkalies and prolonged boiling. They are recommended to be used when difficulty is experienced in matching a shade which necessitates running the goods a long time, or when silk is being dyed that readily chafes. Of course, the use of these agents will improve any fabric, and their use is justified when a quality product is desired.

Some of you gentlemen, are, no doubt, familiar with the Frazier Hosiery Testing Machine, developed by the U. S. Bureau of Standards, which measures the distensibility (the ease with which a stocking can be distended), recoverability (the ability of the stocking to regain its shape after being distended) and stretch endurability (the number of stresses or cycles required to produce a failure) of full fashioned stockings. This machine has enabled us not only to detect faults of the construction of the full fashioned fabric, but also the deterioration and damage caused in the various wet processes. Heretofore, we have had no instrument capable of measuring these factors.

## RESULTS OF FRAZIER TESTS

The following table 1, Frazier Tests, shows a comparative dyeing over a period of three hours with, and without, the use of the protective colloid.

These tests were conducted on practical plant operations. Type of hosiery used, 4 thread-45 gauge. Dyebaths were prepared in the usual manner. One dyebath contained 3 per cent of a protective colloid (based on weight of hosiery) 12 per cent of a mild degumming agent, (sulfonated oil) based on weight of hosiery. The other dyebath was prepared with the same oil, and quantity, but without protective colloid. Split bath method employed. Softener water having a pH 9.0 at the boil. Four stockings were taken from each machine at one hour intervals and the following results were obtained.

It is interesting to note the load in pounds recorded at the first and 200th cycle, at different stages of processing. As the dyeing time proceeds the load in pounds is increased and cycles decreased, which is an indication of damage taking place. With protective colloid present,

***(Continued on page 582)***

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American Association of Textile Chemists and Colorists

SEPTEMBER 20, 1937

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# Detergent, Emulsifying, Finishing and Wetting Agents

## Data on Composition, Properties and Uses—Particularly on the Newer Materials in These Overlapping Fields

***A communication to the A.A.T.C.C.***

### INTRODUCTION

THIS paper is essentially a collection of published data on many of the newer textile processing agents. Scattered information from any sources, mainly foreign publications, has been gathered in an effort to present definite statements on the nature of these materials and properties of their solutions, and on the uses for which they are claimed to be suitable.

Most of the materials are of foreign origin and their names are frequently encountered in the reading of foreign technical literature. This paper is intended to satisfy the reader's curiosity regarding such chemicals which may be unfamiliar, and to assist in the selection of such products for experimental or practical use. General nature and general properties are emphasized rather than specific applications. For the latter, information should be sought directly from the manufacturers or authorized agents of the original or competing products. Attention is called to the excellent table of Textile Chemical Specialties in the Year Books of the American Association of Textile Chemists and Colorists. A little repetition has been necessary in order to approach completeness but most of the material presented here is not in those tables.

The textile processer and finisher have been confronted during the past few years with a wide range of products which have been called "textile auxiliaries," "Textilhilfsmitteln," "assistants" or sometimes by the narrower and less discriminating term "wetting agents." While related in some respects to older and more familiar materials, they are in general rather different chemically and have various combinations of old and new properties.

The materials are frequently grouped together as "surface active," this term properly referring to such as cause a lowering of surface tension in aqueous solution. "Capillary active" is an equivalent term in the German literature. This discussion will center mostly on substances characterized by wetting, emulsifying, dispersing and detergent powers. It necessarily includes behavior with hard water, resistance to acids and alkalies, dye-fixation, and a little on the more indefinite softening and finishing, as well as a few other properties.

Much of the information that is available cannot be confirmed readily, especially that about chemicals of foreign origin. Hence it is merely presented for what it may be worth, but in every case it has appeared from the source to be authentic. However, there are disagreements in the literature and some errors. It is hoped that any of the latter which have escaped notice will be pointed out so that they can be corrected.

## COLLOIDAL ELECTROLYTES

The materials in question are colloidal electrolytes, and belong to a general class of substances important enough for a special session of the Faraday Society and a special publication of 422 pages[8]. This general discussion on colloidal electrolytes did not include as much as might be expected on chemicals for textile processing, but there is a great deal in it of interest to the student of textile science.

Soaps and various other textile assistants are colloidal electrolytes because they dissociate in solution into ions of which one is usually simple, mobile and inclined to stay in solution, while the other ion is large and inclined to form colloidal particles. Hence the term semi-colloids which may also be used.

The properties of the colloidal electrolytes depend upon the balance between their colloid and ionic characteristics. The colloidal electrolytes which are most common are anionic surface active materials because the active part of the molecule is the large, more or less colloidal, anion. Chwala[4] places some of them in the following order of increasing ionic and decreasing colloid character: soap, ordinary sulfonated oils, highly sulfonated oils, fatty acid sulfonates, Igepon, Nekal.

In contrast to the anionic there are also cationic surface active materials with large cations responsible for the surface activity. There is still another class, materials with large active anions and cations both in the same molecule. These several types will be taken up in turn.

After two or three unsuccessful attempts it seems impossible to make an entirely logical classification and arrangement of such a large number and variety of material where there is so much overlapping of properties and of features of chemical constitution. Several formal classifications have been published[3 11 15]. That by Hetzer is fairly recent and one of the most complete.

Owing to the great extent and complication of this field the discussion is limited almost entirely to commercial products. Other materials have been brought in only to illustrate some special point, although many items mentioned in the patent and other technical literature without commercial names are very interesting and are likely to have practical value.

The necessity for limiting the scope of the treatment is shown by Lederer's[15] statement that in the last 10 years there have been about 800 patents on sulfonation applying in this field. Of these there are at least 200 which are important.

## SPECIAL SULFONATED OILS

Among the most familiar sulfonated products are Turkey red oils and various similar materials. Cremer[7] has discussed these products in a very good outline of the effects of sulfonation.

The properties of Turkey red oil as compared with soaps show the very great effect of introducing the sulfonic acid group into the fatty acid molecule. Ever since the discovery of Turkey red oil the effort has been made to introduce as much sulfuric acid as possible in order to increase these desirable properties to the maximum.

The formation of Turkey red oil is an esterification and such reactions tend to be incomplete. Theoretically it is possible to combine 32 per cent of sulfuric acid with the ricinoleic acid molecule. Turkey red oil ordinarily contains but 3 to 7 per cent of organically combined sulphuric acid (Cremer).

The first improvement was Monopole soap where the content of combined sulfuric acid was raised to 10 or 12 per cent. This increase in the so-called "degree of sulfonation" gave an added resistance to acid and calcium.

Beginning in about 1924 there were still further improvements. Typical products are Appret-Avirol E and Prestabit Oil G, the latter with a sulfuric acid content of about 19 per cent. Some of the Flerhenols are also in this class.

These products are far from the theoretically possible degree of sulfonation because only two-thirds of the fatty acid has been converted to the ester. The one oil known at this writing where the theoretical amount is practically reached is Prestabit Oil V.

A. Landolt has given the comparison of sulfonation on another basis, that of percentage of the theoretically complete reaction:

| | |
|---|---|
| Turkey Red Oil | 22% |
| Monopole Soap | 39% |
| Avirol KM Extra | 51% |
| Prestabit Oil V | 93% |

Hetzer[11] has listed Appret-Avirol E and Avirol KM

as sulfonation and condensation products of aliphatic acids but they are based on castor oil.

The acid resistance of the various products has been compared as follows. Equal amounts of 10 per cent solutions will withstand the amounts of sulfuric acid stated below without the separation of free oil:

Turkey Red Oil..... 1-2 c.c. N/10 sulfuric
Monopole Products ..... 8-10
Prestabit Oil G ..... 1000-1500

while Prestabit Oil V will withstand carbonizing.

Parallel with the increase in resistance to acid there is an improvement in wetting capacity and tolerance for calcium and magnesium which greatly increases the range of usefulness of such products. On the other hand such drastic changes alter the fatty character of the oil and make it unsitable for some uses.

Special products have, therefore, been made with just enough sulfonation to bring the initial materials into solution. Typical products are Monopole Brilliant Oil SO 100 per cent and Tallosan which can be called water-soluble olive oil and tallow since they are made from these fats. There are plenty of domestic products of this sort.

Having reached the limit of esterification the next step was the use of stronger reagents, fuming and chlor sulfuric acid, whereby the acid is added to a carbon atom in the fatty acid chain. In the case of a saturated acid like palmitic, it adds to the same carbon to which the carboxyl group is attached, while in the unsaturated oleic acid it adds to one of the carbons at the double bond.

Cremer states that these true sulfonic acids are not used commercially as such. However, a product called Enterol is described as a true sulfonate having a direct carbon to sulfur link instead of the usual esterification in the middle of the sulfonated ricinoleic or oleic acid molecule.

Intrasol is an intermediate product containing both sulfuric acid esters and sulfonic acids, although it is also described as though it were all or mainly true sulfonic acid derivative. The sulfonic acids of fats, as in Intrasol, have wetting capacity and form easily soluble calcium soaps. They also possess the ability to maintain the insoluble calcium salts of ordinary soaps in a highly dispersed form which will not separate out while the bath is being used. They are employed mainly as protective colloids.

## SPECIAL PROPERTIES OF SULFONATED OILS

Wool absorbs the sulfonated oil acids from acid solutions. Chwala[5] has reported that the free sulfonated fatty acid of a highly sulfonated castor oil showed 100 per cent exhaustion on wool after a long treatment in an acid bath. Of this amount 80 per cent could be extracted by petroleum ether leaving 20 per cent chemically combined with the wool. When a less highly sulfonated oil was absorbed to the same extent, only 10 per cent was combined with the wool.

Chwala also states as a fact of peculiar interest that the ordinary highly sulfonated fatty alcohols which retain their fatty character, even upon complete sulfonation, are better for finishing than the oils of either low or high degree of sulfonation[5].

With the less sulfonated oils there are fewer ions present and a greater tendency toward colloidal solution. The more highly sulfonated oils are more easily adsorbed but depart so much from the fatty character that they have different finishing effects.

Some of the undesirable properties of sulfonated oils, just as in the case of soaps, are attributable to the carboxyl group. To overcome this objection such sulfuric acid esters can be further esterified with alcohols which can react either at the carboxyl, at the sulfuric acid group, or at both at the same time. Such products have a greater wetting effect than the original material, this property increasing with the size of the added molecule up to amyl alcohol and dropping off again with further increase in molecular size.

Typical examples of this class are Avirol AH and AH Extra. The AH Extra is a butyl ester represented by $R\text{-}COOC_4H_9$. The carboxyl group can no longer react to form the insoluble calcium soap. Hence such products can be used in hard water. They have the advantage of pronounced fatty character but the disadvantage that the ester is rather easily saponified, with a corresponding loss in wetting capacity.

Hetzer[12] accounts for the improved character of such compounds. One of the principles in the chemistry of textile assistants is that a group which imparts a tendency toward solubility in water, placed at the end of a long "insoluble" chain, favors detergency, as in soap. The sulfonation of castor oil inserts the sulfonic acid groups, which impart solubility, at the 9th or 12th carbon atoms in the ricinoleic acid molecule, or at both, so that they have the effect of shortening the fatty acid chain. The carboxyl group in a neutralized oil (COONa) is less effective because of the "shortened" chain.

When, however, the carboxyl is "blocked" by an alcohol the chain is lengthened at the expense of one of the "soluble" groups. Hence a Turkey red oil with a blocked carboxyl is a better washing agent than the ordinary oil or one of the newer, highly sulfonated types.

Another way of blocking it off is to convert the carboxyl to the fatty acid amide

COOH TO $CONH_2$

The fatty acid amides are insoluble in water but are good emulsifying agents and have been known commercially for many years under the name Duron.

The fatty acid amides can be made soluble by sulfonation and yield products similar to Turkey red oil but which do not form insoluble lime salts. The sulfonated amides have no commercial importance (Cremer) although stated by Hetzer[11] to have high wetting capacity, similar softening effects to Turkey red oil, good tolerance for calcium and excellent tolerance for acid. This group of compounds may contain sulfuric acid esters or true sulfonates.

Under the classification of sulfonation products of fatty acids with suppressed carboxyls Hetzer[11] includes Coloran B7 and Carbo-Flerhenol as special sulfonates on an oil basis, but without any specific description. In his book, Coloran B7 is called a highly sulfonated condensation product of a fatty material and there is nearly a page about it and its various uses. The Carbo-Flerhenol is mentioned briefly as a special sulfonate of castor oil.

## MISCELLANEOUS SULFONATED PRODUCTS

Between sulfonated castor and other oils and aromatic sulfonic acids there are sulfonation products of mineral oils, and naphthene sulfonates, which fit into this position both chemically and in their properties.

Universal Oil BP 200 is a sulfonated mineral oil.

Epifosol is a product for desizing made from naphthenes. Hence it is a mixture of cyclo-aliphatic sulfuric acid esters and sulfonic acids containing some aromatic sulfonic acids, in accordance with the original composition of the naphthene raw material.

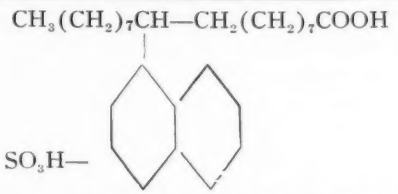
Another group consists of sulfonation products of fatty materials condensed with aromatic compounds. Examples are the Meliorans B 9, D 12, D 12 Special, and F 6. Chemical compositions have not been found but Hetzer describes them as true aromatic sulfonic acids rather than Turkey red oils. Melioran F 6 illustrates the difficulty of obtaining clear and reliable statements. It is included in the description above; is given in Hetzer's book[13] as a sulfonation product of a fatty material plus an aromatic solvent (condensed?) and as the salt of a high molecular sulfonic acid; it is also described[21] as a sulfuric acid ester of a higher fatty alcohol. It has been advertised as a condensation product of a sulfonated higher alcohol, and is listed later with this type of material.

There have been numerous combinations of sulfonated products with solvents for scouring but, in general, a real detergent is needed with them for maximum efficiency. Such mixtures can be easily bought or made.

Next in order are the Twitchell reagents and newer compounds of similar nature which have sometimes been used for desizing, or to increase the lathering power of soap, but are intended primarily for splitting fats. In fact some of the development along these lines was an outgrowth of the scarcity of fat for soap in Germany during the World War.

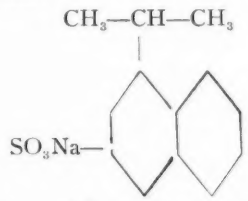
## THE NEKAL TYPE

Twitchell's reagent is useful as a step in the explanation of some of the textile processing materials. It is a fatty acid molecule into which has been introduced an aromatic hydrocarbon which has been sulfonated to make it soluble. Such materials are mixtures rather than individual pure substances. The reagent would have the following formula if regarded as derived from oleic acid and naphthalene:




Its outstanding useful property is emulsifying action, and it is also a wetting agent. The wetting power is better than that of straight sulfonated oils, especially in alkaline solution.

The Twitchell reagent can also be described as an aromatic sulfonic acid with an aliphatic residue attached. The trial of different aliphatic groups has led to products like Nekal and Leonil. They are salts of aromatic sulfonic acids with an aliphatic group of the length of propyl alcohol, or can be called alkyl substituted salts of naphthalene sulfonic acids:




The products are influenced by the nature of the short aliphatic chain. Further, this group and the sulfuric acid group need not necessarily be on the same side of the naphthalene molecule. These products do not have the fatty character of those related to Turkey red oil.

Wetting agents of the Nekal type are not so strongly polar and apparently cannot be adsorbed in such a definitely oriented manner as the long chain compounds. Nevertheless they are good wetting agents. A pronounced ability to diffuse has been attributed to the high degree of sulfonation, and possibly the ability to penetrate is due to the round form of the molecule. Nekal lacks the detergent properties of soap.

The closely related Leonil S, also described as sodium alkyl naphthalene sulfonate, is discussed later under wool dyeing in comparison with other products. This material is relatively stable to acid. Of somewhat better wetting capacity is Leonil SBS listed by Hetzer[11] as a free alkyl naphthalene sulfonic acid.

The following notes on its use in carbonizing are from Nuesslein[18] and are given here to illustrate the type of claims made for wetting agents for this purpose.

The employment of suitable wetting agents allows the use of 2½° Bé (3.3%) sulfuric acid in place of 4° Bé (4.8%). This not only saves in cost but is of definite advantage because carbonizing is a process intended to act on impurities in the wool and not on the wool itself. Since, with the wetting agent, there is more than the mere surface wetting obtained with the ordinary cold dilute acid solution, the carbonization can be completed under less severe conditions, that is, at a lower temperature

and possibly in a shorter time. There is also better uniformity of impregnation of the wool itself, and more complete extraction of the acid owing to reduced surface tension, so that considerable less solution is actually consumed.

The great improvements in the process enable piece goods to be carbonized before dyeing with much greater certainty of uniform results.

In a sense such a wetting agent must withstand hot sulfuric acid at all concentrations, for during the baking an indefinite range of concentrations will be encountered and the assistant must not decompose to anything that cannot be washed out from the wool.

Hetzer[11] gives such a complete treatment of this chemical group that it is included as a separate section.

## AROMATIC SULFONIC ACIDS AND THEIR SALTS

Through the sulfonation of aromatic hydrocarbons and their derivatives, true sulfonic acids are formed which are soluble as such or as the alkali salts. The benzol derivatives do not have any soap-like properties but the alpha and beta naphthalene sulfonic acids and alkali salts foam freely and have been recommended as additions to soap. With increasing molecular weight the soap-like character increases.

Octahydro anthracene sulfonic acid has not only a higher molecular weight but also has what amounts to cycle-aliphatic side chains attached to the sulfonated benzene nucleus. Such aliphatic side chains, especially if open like propyl or butyl radicals, add greatly to the soap properties of aromatic sulfonic acids. Wetting power and lathering increase in the series of sulfonic acids of the following compounds:

Benzene
Naphthalene
Tetraline
Octahydro anthracene
Propyl naphthalene
Dibutyl naphthalene

The last two especially have high foaming, wetting and emulsifying capacity, and are not sensitive to calcium. Their main advantage, however, lies in their great stability to acid; and the free acids are soluble in water and acids at all concentrations met with in textile work. Thus they are ideal wetting and penetrating agents for carbonizing. However, their general application has been somewhat limited because they do not leave the desired feel in the goods like wetting agents based on fatty materials. They are like the Turkey red oils in lacking detergency.

There are many products along this line but their practical value is not known to the writer:

| | |
|---|---|
| Carbolan | Aromatic sulfonic acid mixture. |
| Algosol | Sodium salt of monobenzyl aniline parasulfonic acid. |
| Solvenol | Sodium salt of benzylsulfanilic acid. |
| Dinaton | Sodium salt of n-dimethylmetanilic acid. |
| Parasanol | Sodium salt of naphthalene sulfonic acid. |
| Mayamin | Sodium salt of betatetralin sulfonic acid. |
| Mayaminkalium | Potassium salt of tetralin sulfonic acid. |
| Mayammonium | Ammonium salt of beta-tetralin sulfonic acid. |
| Octaton | Sodium salt of octahydro-anthracene sulfonic acid. |
| Alkanol S | Sodium salt of tetrahydronaphthalene sulfonic acid. |
| Eunaphthol K | Potassium salt of alkylnaphthalene sulfonic acid (note below). |
| Neomerpin N | Naphthalene sulfonic acid. |

Sodium salts of alkyl-naphthalene sulfonic acid

Alkanol B. SA. HG
Betan
Betan N 50, N 80, R 100
Invadene N (since replaced by B)
Leonil N, S, SB
Nekal A dry
Nekal BX dry
Oranite powder
Perminal W

Alkylnaphthalene sulfonic acid products

Brecolane N
Leonil SBS
Nekal S
Rigal N, P, Rex

Of course this list is not complete but it will serve to emphasize the great number of possibilities in this field and the difficulty of determining what products are of most value.

Eunaphthols K and ED, included above, are products for dissolving naphthols and have been described in another place[21] as made by the condensation of sulfo naphthalene and formaldehyde.

The several brands of Nekal are not very definitely distinguished. Some writers have indicated the type as a butyl instead of a propyl compound. Nekal AEM is intended for use as an emulsifying agent and has the same general description, sodium salt of alkyl naphthalene sulfonate, but with the addition of a protective colloid, gelatin. Leonil LE is analagous to Nekal AEM and is described in the same way.

As already noted, this general type of compound lacks detergent power. Commercial brands have, therefore, been made up with organic solvents but the materials are more effective when used with real detergents. Examples of such mixtures occasionally encountered in the literature are Laventine BL which contains methyl cyclo hexanol and turpentine. Others with solvents are Laventine KB, Oranit (some marks out of a dozen brands), and Lenocal liquid

described as analagous to Laventine HW. This Laventine is, however, more likely based on Igepon as mentioned later. Others are Flerhenol, which is Nekal with trichlorethylene, and Neomerpin which is Nekal with a solvent such as methyl cyclo hexanol.

The sodium ligno sulfonates recovered from wood-pulping liquors, Dekol and various Protectols, form another sub-group in this class.

Synthetic tanning materials also fall here as a sub-group:

| | |
|---|---|
| Ondoval G, 2G | Sulfonated anthracene residues. |
| Neradol D | Cresol sulfonic acid-formaldehyde compounds. |
| Neradol ND and Gerbstoff F | Naphthalene sulfonic acid-formaldehyde compounds. |
| Gerbstoff H | Naphthalene sulfonic acid-sulfur condensation product. |

## SULFATED ALIPHATIC ALCOHOLS

It has been predicted that the sulfated aliphatic (fatty) alcohols may prove to be the most important of all the recent textile chemical specialties. The lack of detergent and finishing properties in the aromatic sulfonic acids are factors which led to the extended development of aliphatic compounds as textile assistants. Also, the reduction of the fatty acid of high molecular weight to the corresponding alcohol is another way of eliminating the effect of the carboxyl group.

The derivation from fatty acids suggested the name "fatty" alcohols. Some of these fatty alcohols are found in natural waxes as fatty acid esters of the alcohol:

$$R.CH_2.COO.CH_2R$$

By saponification of the wax there are obtained the fatty acid and alcohols of 16 or 18 carbon atoms. These alcohols are limited in their practical interest by the high melting point of those which are saturated.

Of more value are those of 10 to 14 carbon atoms which are obtained from cocoanut oil fatty acids by reduction with hydrogen at high pressure with the assistance of suitable catalysts. Then they are converted to sulfuric acid esters and thus made soluble in water. The resulting products are represented by the Gardinols which have detergent value as well as stability to hard water.

There may sometimes be confusion due to the loose use of terms like sulfates and sulfonates. Commercial "sulfonated" alcohols are mainly sulfuric acid esters but in some cases true sulfonic groups may be present also. To illustrate, $C_2H_5SO_2OH$ is a sulfonic acid and may be looked upon as sulfuric acid with one hydroxyl replaced by an alkyl radical. Sulfonic acids are comparable with strong mineral acids and are not hydrolyzed by boiling in alkali. On the other hand the sulfuric acid ester is $C_2H_5OSO_2OH$, where a hydrogen only is replaced by the alkyl radical.

Another way of putting it is to say that in the true sulfonic acid or sulfonate the sulfuric group is attached directly to a carbon atom of the aliphatic chain while in the ester it is attached through an oxygen bridge.

To make this clear it has been proposed to use the term "sulfated fatty alcohols" as preferable to "fatty alcohol sulfonates" or similar expressions.

The sulfuric acid esters, which constitute most of the active part of the commercial products, react neutral in aqueous solutions, like salts of strong acids with strong bases. In the commercial products there are only members with end sulfo groups (Cremer) and they are stronger electrolytes than soaps.

The solutions of fatty alcohol acid esters and fatty alcohol sulfonates are stable to lime, acids and alkalies. Calcium salts may be formed but they are soluble.

J. G. Evans has stated that cetyl sodium sulfonate is definitely inferior in solubility and in wetting and detergent power to cetyl sodium sulfate, detergency being only a quarter of that of the sulfate. (Cetyl sodium sulfonate is $C_{15}H_{31}—CH_2—SO_3Na$.)

Cremer has stated that Intrasol (already mentioned) is the only commercial product which is a true sulfonic acid. It has a good dispersing action on lime soap.

The properties and uses of the most common commercial materials are generally familiar.

The best known members of this group are the Gardinols. The CA and LS brands are the sodium sulfate of technical oleyl alcohol. The WA brands are the sodium sulfate of technical lauryl alcohol[16].

Several other "marks" are found in the foreign literature; R and SE are listed in Hetzer merely as analagous to the WA conc.

Duponals are also listed in the Year Book and are understood to be the same as the Gardinols. In addition Duponol ME is Gardinol WA very nearly free from inorganic salts.

In most cases the aliphatic alcohols are esterified with sulfuric acid. An exception is Setavin ON, an ester with an organic acid.

The various products are frequently described as sulfonated fatty alcohols when they are in reality the sodium salts of sulfated alcohols. The following materials are all believed to be such sodium salts and not free alcohols or free sulfuric acid esters unless specifically stated. One or more of the Brilliant Avirols are mixtures.

Acorit

Brilliant Avirol L 142 (Avitex SF)
Based on stearyl alcohol.

Brilliant Avirol L 168 (Avitex W)
Based on stearyl alcohol.

Brilliant Avirol L 144 (Avitex AD)
Based on oleyl alcohol.

Brilliant Avirol L 200 (Avitex C)

Cyclanon OA and LA

Florinat VP, with an added solvent, stable in hypochlorite.

Gardinols (see A. A. T. C. C. list)[24]

Homogenol WW, related to Brilliant Avirols L 142 and L 168.
Inferols, 229 B; 229 BNS; 229 G; 229 W (Some other Inferols are sulfonated oils or cresol products).
Lissapols A, AF, C, AT
Lorol sulfate
Melioran F6, L (see below)
Metapon (claimed 90% fat content)
Ocenol sulfate from Ocenol or Oleyl alcohol
Oleyol
Propylat K 10
Pulitol
Sapidans, N, W, CAN, Special etc.
Stenolat V
Texapon Paste, Powder (from lauryl alcohol)
Ultravon FA

There are also related or similar special products.

Ondal is a product of the Gardinol type with peroxide in a stable form for a combined soaping and developing agent for vat dyes, and for other uses.

Homogenites B and W are specialties for use in peroxide bleaching.

"Pelzwaschmittel TA and TAV" are fatty alcohol sulfonates for washing pelts.

Lanaclarin LM and LT contain solvents for fats; MK is advertised as Gardinol with a solvent.

Humectol is a sulfuric acid ester of an amido fatty alcohol for use as a Naphthol AS solvent, not a very definite description. Humectol C represents one of the early attempts to block a carboxyl group.

Melioran F6, given in the list above has already been described as being at the same time a condensation product.

## THE HIGHER ALCOHOLS

The higher alcohols employed in the products just described may also find use as free unsulfonated alcohols for such purposes as finishing and for assistants in emulsification. For example six or seven per cent of oleyl alcohol mixed with mineral oil enables it to be scoured easily from wool[14].

Some of the commercial forms are:

Brilliant Avirol L 168 (now called Avitex) which contains both sulfated and free technical stearyl alcohol (also reported to contain free lauryl alcohol).

Lanette Wax, a commercial mixture of cetyl and stearyl alcohols[3].

Cetol Wax
Lorol, technical lauryl alcohol
Ocenol, technical oleyl alcohol
Stenol, technical stearyl alcohol.

## FATTY ACID CONDENSATION PRODUCTS

The next group of "synthetic soaps" or, better perhaps, soap-like chemicals is that of fatty acid condensation products, of which the most familiar examples are the Igepons. They are not fatty alcohol sulfonation products as has sometimes been stated.

The makers of these materials have the advantage that they can start with fatty acids which are cheaper and more readily available than the related fatty alcohols.

Igepon A is the sodium salt of the oleic acid derivative of isethionic, or hydroxy ethyl sulfonic acid:

$$C_{17}H_{35}.COO.C_2H_4SO_3Na$$

Igepon T results from the condensation of a fatty acid with taurin, amino-ethyl sulfonic acid:

$$C_{17}H_{33}.CON.C_2H_4SO_3Na$$
$$\quad\quad\quad

tion to wetting and detergent effects it is supposed to offer an inexpensive means of avoiding lime soap troubles; and to serve as a vat dye assistant to improve uniformity and to increase resistance to rubbing[17].

## CATIONIC SURFACE ACTIVE MATERIALS

The active part of soap and of most other surface active materials is a large organic anion with a negative charge.

Obviously the presence of large positive ions will give to a solution different properties from those imparted by large negative ions. Cationic surface active materials, or those of the first type are now on the market and have unusual and important properties.

Bertsch[2] has presented a good introduction to this group of materials and his rather optimistic views will be passed along because they are so suggestive even though not yet widely reduced to practice.

If one of the more familiar anion active substances is added to a suspension of lamp black in water the particles are peptised because they are negatively charged, but if one adds a cation active substance the particles are discharged and flocculated. This principle finds application in the purification of waste water and in the breaking down of troublesome emulsions.

Upon these fundamental experiments are based numerous possibilities for the application of the cation active substances. There is still another valuable property. They collect upon boundary surfaces and are so firmly fixed, for example on the surface of a plant fiber that they act like films and impart the properties of a positively charged body. Cotton thus becomes substantive to all negatively charged particles and one can adjust the substantivity at will. He can alter the film of cation active substance by the careful addition of some anion active material and thus reduce the charge or remove it, so that the fiber can be given any intermediate degree of substantivity.

The flocculating of negatively charged particles may go rapidly to form a coarse precipitate or take place slowly to form a finely divided and even deposit. As an example of such a process a viscose rayon was "dyed" with freshly precipitated ferric hydroxide completely fast to water, light and rubbing[2].

In this way pigment colors have been developed in paste form which will not only color rayon but which will give at the same time a fast-to-water dulling of the luster. It is, therefore, possible now to use dulling pigment dyes for most shades in a form substantive to rayon[2].

Especially important is the possibility of depositing vat dyes in the unreduced form with surprising levelness on plant fibers, for subsequent fixing by reducing and oxidizing. This process of dyeing of unvatted pigments with cation active substances has the advantage of yielding very level results with the worst levelling dyestuffs because the exhausting on the fiber can be changed at will. Any mistake at the stage of initial deposition can be corrected by the aid of suitable anion active materials and the dyer will have in the future a very readily adjustable range of materials and methods.

It will no longer be necessary to select dyes and finishing materials according to their chemical nature and its relationship to the fiber but one can deposit charged films upon the fiber exactly as needed for their distribution and fixation. From the writer's limited experience with such materials the msot natural comment is that much will depend upon the fastness or stability of the charged film "mordant" if it is expected to fix a dye; and upon the dye itself if the film serves mainly to distribute the dye in a level form and to fix it.

As an example of a special dyeing process Bertsch[2] has proposed that unions of animal and vegetable fibers can be dyed to uniform shades with acid colors following a suitable treatment of the goods with a cation active agent. Of course acid dyes must be found which will be fast enough on the cotton.

Dyes of opposite chemical type, that is basics, will tend to be dispersed rather than precipitated by Sapamine, for example. Hence it is offered as a retarding and levelling agent for this class of colors.

The long desired substantive finishing is also possible because the finishing material can be "dyed" substantively on the fiber, that is, exhausted on from a suitable bath to a greater or less extent. Evidently, also, this substantive finish should be capable of modification through serving as a "mordant" for some other finishing material.

Cation active materials have been called inverted soaps. Chemically, the name may seem to fit but actually, although these bodies cause foaming, they do not have at all the same detergent effect as soap. They cannot disperse and remove the dirt which usually becomes suspended in solution as negatively charged particles. They tend, rather, to precipitate the dirt on the fabric. The property which makes them valuable for so many uses is just the opposite of that required for detergency. Cation active substances lower the washing value in neutral or alkaline baths below the corresponding value for water.

Electropositive and electronegative agents can be mixed in proportions which balance the charges and such mixtures have neither a positive nor a negative effect on the detergent value. While this may be true to a limited extent it is also true that such positive and negative agents will frequently precipitate each other and become inactive.

The term cationic active materials is correct, and is preferable to such names as acid soap or inverted soap. E. W. Pierce[19] has written one of the few articles found in English on these substances and calls them soap-like bases, for if we consider soaps to be like acid and basic dyes, these would be basic soaps or really soap-like bases.

## KINDS OF CATION ACTIVE ASSISTANTS AND THEIR USES

One of the most common uses for cation active materials is the fixation of direct dyes to improve their fastness to water. Chwala[6] has considered this group of new basic

materials from this point of view. His classification and a discussion of indiivdual materials for this and other purposes will follow:

(1) Colloidal electrolytes in the form of high molecular bases with tri- or pentavalent nitrogen.

(a) Aliphatic

(b) Aromatic or heterocyclic

(2) High molecular bases with tetravalent sulfur, pentavalent phosphorus or antimony, etc.

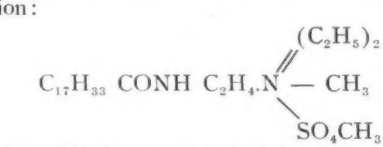
In the first group as early as 1923 the Society of Chemical Industry in Basle had patented oleic acid diethyl amino ethyl amide, the first of the Sapamines. While the formula is somewhat complex, the compound is based on ordinary ethylene diamine with several other common constituents. The first brand was CH (chlor-hydrate), the hydrochloric acid salt of the soap-like amine:

$$C_{17}H_{33}\ CONH\ C_2H_4\ N\ (C_2H_5)_2\ HCl$$

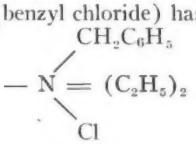
It ionizes to the large active cation and a small inactive anion, chlorine.

Sapamine A (acetate) has acetic acid in place of the hydrochloric acid.

Sapamine MS (methyl sulfate) is of somewhat different composition:



Sapamine BCH (benzyl chloride) has the end group:



These last two derivatives of ethylene diamine are also quaternary ammonium compounds.

Sapamine KW is also a salt of a high molecular nitrogen base or soap-like amine with an affinity for all textile fibers. It is offered particularly for improving the fastness of direct dyes to water, controlling the rate and penetration in dyeing basic colors and for softening. Its composition has not been found.

Sapamine FL is still another brand, claimed to be usable in direct dye baths for softening.

There are other cationic materials which are quaternary ammonium compounds. Lissolamine A is a long chain quaternary ammonium salt used for stripping.

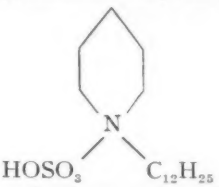
Metabols O and WS are described merely as quaternary ammonium compounds, all of which do not necessarily have the cationic active properties under discussion. These products are for discharging.

In some of the quaternary ammonium compounds the nitrogen atom forms part of a pyridine or quinoline ring.

Hall[9] has covered typical formulas and uses for quaternary ammonium, pyridinium, sulfonium and phosphonium compounds based largely upon patent literature and without identifying the chemicals by commercial names.

Lissolamine (no mark) covered by an early patent is octa decyl pyridinium bromide.

Several Radium Mattines and products of somewhat similar name are pyridinium lauryl sulfate



combined with organic pigments for delustering rayon.

Fixanol (I.C.I.) is a cyclic amine or quaternary ammonium compound on a pyridine base obtained by reaction between pyridine and an organic chloride, bromide or sulfate. It is supposed to be cetyl pyridinium sulfate, although this compound has been described in another place as the *forerunner* of Fixanol. The formula is analagous to that given above.

The sulfate imparts solubility and the rest of the molecule the colloidal character. It is claimed to have a softening effect as well as to fix direct dyes.

Some other dye fixing agents seem to fit in here although their exact character is not known. Solidogen B is an alipathic amine of high molecular weight, with trivalent nitrogen. Sandofix is a nitrogen base agent for aftertreating.

Commercial examples of the sulfonium and phosphonium compounds have not been found.

The patent literature of these products speaks of salt formation between the dye and the reagent when they are used for aftertreating. As a result of extensive research it has been concluded[6] that there actually is formation of an insoluble salt with the properties of an electrolyte, from the anions of the dye and the cations of the high molecular base. The reactions are reversible and the resulting salts can be dispersed by salts of the bases which cause the precipitation, by the dye solution itself or by anion or cation active colloidal electrolytes.

Dyes are not fixed as fast to soap by Sapamine as they are to water, evidently because the Sapamine becomes "neutralized" to some extent in accordance with explanations above. The manufacturer should be consulted for specific uses and limitations of any of these materials.

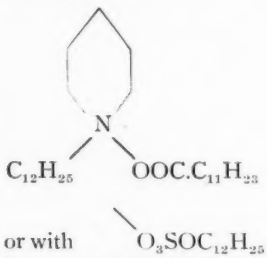
Applied Chemistry Reports for 1936[22] gives an interesting discussion of cation active agents with various uses as proposed in the patent literature.

## ACTIVE ANIONS AND CATIONS IN ONE MOLECULE

Since we have both anion and cation active materials it is to be expected that there would be compounds having the constitution of both at once. Such have been prepared. They have been found to have substantive properties and to be effective as softening agents but not as detergents. One marketed under the name Repellat is described as a lauryl pyridinium compound useful as a

dyeing assistant with a retarding action, and for finishing.

In general this type of compound is still probably of more theoretical than practical interest. Some have been based on pyridine with two long aliphatic chains attached to the nitrogen, or on the attachment of two similar chains to a nitrogen atom as illustrated below. These are very long molecules if fully extended.



or with $O_3SOC_{12}H_{25}$

These compounds are lauryl pyridinium laurate and lauryl pyridinium lauryl sulfate and have a carboxyl or a sulfate group attached directly to the nitrogen. The other type of compound, prepared by Reychler, is

$$C_{16}H_{33}—N(C_2H_5)_3—O_3SOCH_2(CH_2)_{14}CH_3$$

Triethyl cetyl ammonium cetyl sulfate.

## OTHER BASIC ASSISTANTS

There are other commercial assistants which are basic but are not very definitely described. Some are of the heterocyclic pyridine type which have wetting, dispersing and levelling, as well as some detergent properties although the latter do not approach those of soap. Such are Oxycarnite BR and Tetracarnite. While it has not been desirable to include many mixtures in this discussion, some of them are very suggestive. Oxycarnite L50, being offered in Germany for improving penetration, level dyeing and fastness to rubbing of Zellwolle (staple rayon) and its blends with other fibers, consists of Tetracarnite and Gardinol. Such pyridine bases are used in various other "carnite" mixtures.

The ethanolamines are useful bases for various purposes and can be purchased under their true names.

Eulysin A is an organic base with the mild action of ammonia but stable and non volatile like the common alkalies. It converts saponifiable fats on the goods into soap with strong emulsifying properties. In fact, the soap with this base is claimed to have about the strongest known emulsifying action. It is also an anti-oxidant which retards any tendency of oil in the goods to oxidize to form stains and products which resist removal.

It is offered particularly as a dissolving and dispersing agent for dyestuffs.

To illustrate again the difficulty of getting definite knowledge of such products, Hetzer[13] gives Eulysin A as an alkyl naphthalene sulfonic acid derivative plus a fat solvent but also states that, according to the maker of the product, it contains an amine rather than a solvent.

## UNCLASSIFIED PRODUCTS

A few products of fairly wide use or other special interest do not fall in any of the classes of assistants already discussed.

Peregal O does not belong to either the anion- or cation-active groups but utilizes a property of hydroxyls, the tendency to make organic compounds soluble. It is a condensation product of octadecyl alcohol and ethylene oxide. It is not an ionogen and is free from salt, a point of special interest if it is being used with direct dyes.

The explanations for the levelling action of Peregal O are still rather theoretical and not very clear. The pronounced retarding action is supposed to be due not only to the ability to disperse such materials as insoluble dyes, pigments and lime soaps, but to some additional effect within the dyebath. For example, there is a theory that Peregal O forms an unstable addition product with the leuco form of a vat dye. In the case of direct dyes, measurements on the highly dispersed Chicago Blue 6B showed that the dissolved dye molecules were changed to larger aggregates by the addition of levelling agents and that the Peregal O served to give centers for such accumulations. Whatever the mechanism, it is obviously not the same as salting-out although the explanation sounds like it. As a matter of fact it counteracts salting out.[20]

Peregal OK is another product of the same chemical nature as Peregal O. Its advantage is that it can be used with vat dyes without increasing the alkali concentration of the bath.

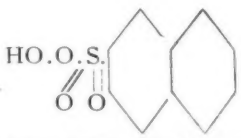
Palatine Fast Salt O is another fatty derivative of somewhat special use as a levelling agent. It is neither an alcohol sulfonate nor an Igepon and has been made soluble in an entirely new way, but no description of the material itself has been found. It is stated to be insensitive to lime and metals as it has no group which can form salts, nor is it affected by alkalies or acids. Since it lacks an acid group it has no affinity for wool and therefore acts in a different way from Leonil S and Igepon T. Nuesslein[18] claims that it is the only actually active product which improves the levelness of Palatine Fast dyes, and it even allows the amount of acid used in dyeing to be appreciably reduced.

The Emulfors are interesting compounds, apparently different from anything else. Emulfor, probably the original material, is approximately $C_{12}H_{25}(O.C_2H_4)_n.OH$ where "n" is more than 10, a poly ether alcohol with no ionizing group. Lawrie notes that Emulfor O "may be" a polyethylene glycol condensation product. It does have numerous polar orienting ether bridges which impart solubility. It is used particularly to disperse polar compounds such as oleic acid rather than non-polar materials like mineral oils. There are now, however, Emulfors for other oils as well as for fatty acids.

The Emulfors are, in general, soluble in the material to be dispersed as well as in the surrounding medium so

that they may serve as colloid dissolving agents (couplers).

Biancal is a material for a somewhat different purpose, that is, to bleach to some extent as well as to serve as a wetting and scouring agent in the kier boil. It is claimed to be especially effective on motes. It is an organic persulfonate:



There has been recent foreign literature on Medialan and Igepals which are supposed to surpass most of the earlier assistants in various ways. There has been nothing available on their chemical nature although descriptions of Medialan indicate that it is a carboxylic acid with other groups arranged in such a way as to overcome or avoid the usual undesirable effects of the carboxyl group.

## GENERAL PROPERTIES

The properties assigned in this discussion to the various materials are mostly those given in the literature. Many of them are well known. There has been no attempt here to compare individual brands because there are so many factors which should properly enter into such comparisons and but few suitable data are available. The uses given are illustrative and in general are not necessarily limited to products specifically mentioned.

It has been the usual experience that off-hand comparisons of different types of wetting agents are likely not to yield correct results. Temperature, pH, and the presence of other materials in the solution may have important effects and should be considered. Comparative values are not necessarily the same for one set of conditions as they are for another. Such points were particularly emphasized in a discussion by the Society of Dyers and Colourists[25]. Materials should, therefore, be compared under conditions as near as possible to those of practical use or within whatever range of conditions may be allowable.

Weltzien and Ottensmeyer[23] have described an example of an abnormally good effect due to the presence of impurities. It was found that commercial products gave greater lowering of surface tension than purified products, in proportion to the amounts used; and this was shown to be due to the presence of electrolytes.

A great deal of work has been done on the so-called stability of soap-like substances to hard water, as compared with soap. Stability is not the correct term. It is a question of the greater or less solubility of the calcium or magnesium salts in water, and of separating out.

If ordinary soaps are present at the same time it becomes also a question of dissolving or dispersing the calcium and magnesium soaps formed from them. Hart[10] has already covered this in the REPORTER.

It is considered that the calcium salts of soap-like compounds form colloidal rather than true solutions in water. However, the solubilities of some of them have been given as follows:

| *Compound* | *No. of carbon atoms* | *Solubility grams/100 cc.* |
|---|---|---|
| Calcium lauryl sulfate ..... | 12 | 300-400 |
| Calcium myristyl sulfate ..... | 14 | 30 -40 |
| Calcium cetyl sulfate ..... | 16 | below 5 |
| Calcium stearyl sulfate ..... | 18 | below 5 |

Not only do the solubilities of the calcium salts of the dispersing agents follow the molecular weights in a homologous series as in the table above, but the rule of greater solubility with lower molecular weight holds to some extent even though the compounds being compared are not closely related chemically.

Special assistants may be used in combination with soap, more for their protective than for their detergent action. Those which are the best dispersing agents for insoluble soaps are not necessarily the best for scouring.

In hard water the reagent may be lost the same as soap but may have the advantage of not forming a precipitate because the alkaline earth salts are soluble.

Leonil S and Igepon T have practically unlimited stability to acids and may be used in acid dyebaths for levelling.

They have an affinity for wool like a dyestuff, the reason for their levelling action. They can combine to form salt-like compounds with the basic groups of the wool and while they are occupying these wool groups there is a tendency for less dye to combine with the fiber. Hence dyeing is retarded. The rate of dyeing, however, depends also upon other things and the result depends upon the dyestuff and other conditions at the time of dyeing. Judging from published accounts there is a great deal yet to be learned about this process.

It is probably poor technique to begin and end with an apology but the nature of the material renders it impossible to be complete and correct in all particulars. Unfortunately, too, an article of this sort is likely to be out of date as soon as it is written, because of the appearance of new products whose nature is not immediately made known. Also, older products are continually being improved or replaced, perhaps under new names or with changes in composition. Statements that a product is the only one of its kind or that some particular type has not been made commercially are subject to exception at any time.

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These are but a few of the many references which might be given.

—Charles F. Goldthwait,
*Mt. Lebanon, Pittsburgh, Pa.*

## TENTATIVE PROGRAM

Fall Meeting—Southeastern Section
American Association of Textile Chemists and Colorists
Colonial Hotel
La Grange, Georgia — Oct. 9, 1937

7:00 P. M.—Banquet—$1.50 per plate
Address of Welcome
Mr. Roy Swank, Editor, La Grange News
Response
Mr. E. A. Feimster, Jr., Section Chairman
Entertainment
Music by Sanders' Orchestra
8:00 P. M.—Business Meeting
8:15 P. M.—Technical Program
1. Physical Textile Testing
Mr. R. H. Adams, Callaway Mills
2. Discussion
Leaders:
3. European Textile Laboratories
Mr. P. N. Collier, Callaway Mills

All members and friends of the association are cordially invited to attend all or part of the meeting. If you are coming, please notify Mr. M. T. Johnson, 900 Washington St., LaGrange, Ga., as soon as possible. In order to insure adequate accommodations, it is important to know the approximate attendance by Oct. 6.

E. A. Feimster, *Chairman.*
A. R. Macormac, *Secretary.*

## Publications and Test Materials, With Prices

### AMERICAN DYESTUFF REPORTERS

Back numbers of the year 1937 can be obtained from Howes Publishing Co., 440 Fourth Ave., New York City: earlier numbers from the Secretary of the Association, Lowell Textile Institute, Lowell, Massachusetts. Prices postpaid: 50c each to non-members, 35c to members; complete volumes $5.25 to non-members, $4.50 to members.

### YEAR BOOKS

From the Secretary, Postpaid

Current volume, to non-members, $3.50; to members, one extra copy per member $2.50. Back numbers, to non-members, $1.50; to members, $1.00.

### REPRINTS FROM THE AMERICAN DYESTUFF REPORTER AND YEAR BOOK

From the Secretary, Postpaid

| | |
|---|---|
| Light Fastness Reports, I, II, III, bound together | $1.00 |
| Light Fastness Reports, I, Series 3 | .20 |
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| Light Fastness Reports, VI | .20 |
| Analytical Methods for a Textile Laboratory | .75 |
| Wool Carbonization, I, II, III, Sulfuric Acid | .50 |
| Wool Carbonization, IV, V, VI, Sulfuric Acid and Aluminium Chloride | .50 |
| Determination of Wool in Wool-Cotton Textiles Materials | .40 |
| Printing Pastes, Preliminary Report | .40 |
| Vat Printing Pastes, I | .40 |

Reprints on Researches by the Association at the National Bureau of Standards may be Obtained from the Superintendent of Documents, Washington, D. C.

### MATERIALS FOR TESTS

From Chairman of A.A.T.C.C. Research Committee, Lowell Textile Institute, Postpaid.

| | |
|---|---|
| Knitted Worsted Tubing, under fifty yards, per yard | $ .23 |
| fifty to ninety-nine yards, per yard | .20 |
| 100 yards or more, per yard | .18 |
| Washing Fastness Standards, Cotton, per set | 1.00 |
| Wool, per set | 1.00 |
| Silk, per set | 1.00 |
| Crock-Meter Cloth, per package | .20 |
| 3 packages | .50 |
| 7 packages | 1.00 |
| Crock-Meters, from W. C. Durfee Co., 114 Federal St., Boston, Mass. | 12.50 |
| Counter, attached, additional | 6.00 |

Launderometers, from Atlas Electric Devices Co., 363 West Superior St., Chicago, Illinois.

AMERICAN
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## ANNUAL MEETING

THE Seventeenth Annual Meeting of the American Association of Textile Chemists and Colorists will be held in Philadelphia on December 3rd and 4th. Headquarters will be at the Bellevue-Stratford Hotel.

Committees for this event were formed early in the season by members of the Philadelphia Section, acting as host for this year's event, and they have been active in making arrangements to prepare for the gathering. It is the intention of the local committees that the meeting and convention will be one of the most largely attended and worthwhile of any yet conducted by this organization. Judging by the work which has already been done and which is in process it looks as if the Philadelphia committees would see their intentions brought to fulfillment. There are only a few more weeks left before the meeting and convention opens and members of the Association are urged to make their plans now to attend.

In conjunction with the meeting we shall present to our readers our

### Second Annual
### PROCESSING REVIEW NUMBER

which we intend to issue under date of November 29th, 1937. Our initial effort in this direction on the occasion of the annual meeting last year met with such a degree of success that we can assure you that our second edition will contain an even greater amount of valuable information. As last year we intend to feature all the new products for textile wet processing which have been introduced to the trade since last November. We shall arrange these products under the headings of dyestuffs, chemicals and equipment. Manufacturers cooperated with us to the fullest extent on this feature last year and we again invite them to submit information concerning their latest developments for publication in that section.

In addition, for this issue, we shall again review what has taken place in the various branches of the textile wet processing field during the past year. Recognized experts will write about the latest developments in the dyeing and finishing of cotton, wool, rayon, silk and mixed fabrics and information regarding the latest research projects sponsored by various associations in the textile field as well as other information of value will also be presented.

Speaking of research the second edition of the

### QUARTERLY RESEARCH NUMBER

will appear in our issue of October 18th. As you will recall, the first edition appeared in our issue of July 26th. Judging by the number of requests we have had for copies of that particular issue, it proved to be of considerable value to readers to have the reports of the various research projects gathered together to be published in four quarterly issues. There is no doubt but what the next edition will prove equally as valuable.

***Quarterly***

**RESEARCH NUMBER**

**Issue of**

**October 18, 1937**

***Second Annual***

**PROCESSING REVIEW NUMBER**

**Issue of**

**November 29, 1937**

# Silk Hosiery Processing

*(Continued from page 568)*

the load in pounds recorded is less, thus proving damage to the fibroin has been retarded.

### CREASES, CROWSFEET AND BROKEN FIBERS ETC., ON 8 TO 14 THREAD HOSE

These are commonly called service weight. Higher thread numbers naturally contain more silk. Hosiery, even though it is carefully netted, is subjected to friction during the dyeing. Friction means chafing, resulting in broken filaments, which show up in the finished hose as "white streaks" commonly known as "Work Streaks." Recently, there have been offered on the market, the higher sulfonated, fatty alcohols. Some types of these used in the dyebath, act as very efficient lubricants. It has been found that their use goes a long way in overcoming this very serious difficulty. Incorporating a protective colloid with products of this type, gives very satisfactory results.

A very successful method is as follows:

Prepare dyebath at the boil. Enter 6 per cent to 7¼ per cent of a mild degumming agent, boil 20 minutes, flush over machine, and drop liquid. Prepare fresh bath. Add 6 per cent to 7½ per cent of a mild degumming agent.

Three per cent sulfonated fatty alcohol, dyestuffs, etc. Boil 25 to 30 minutes, sample to determine whether the gum is removed, then add 3 per cent of a protective colloid, run 10 minutes, add salt and dye as usual. Practical runs have been made for a period of 3 hours dyeing and hosiery was in excellent condition.

Chafing and creases were reduced to a minimum, and the silk retained its soft, natural appearance.

### PREVENTING REDUCTION OF DYESTUFF

Certain types of dyestuffs, especially in the presence of silk gum, alkalies, and metals, at elevated temperatures, reduce on prolonged boiling. Types such as sulfocyanine Blacks and Blues are particularly susceptible. Many suggestions have been made to overcome this, such as dyeing with the lids of the machines open, passing air through the dyebath, dyeing at a lower temperature, etc., but the results are never consistent. Recently, there has been a class of products offered to the trade which we may term as oxidants, and when added to the bath, in small propor-

**TABLE I**

**Frazier Test—With and Without Protective Colloid in the Dyebath**

| *Stage of Processing at Test* | *STOCKINGS* | *Stresses or Cycles* | *Loads in Lbs. at* 1st Cycle | 200th Cycle | *Average Loads* 1st Cycle | 200th Cycle | *Average Stresses or Cycles* |
|---|---|---|---|---|---|---|---|
| One hour dyeing with protective colloid | A | 2208 | 66 | 44 | | | |
| | B | 2385 | 64 | 40 | | | |
| | C | 1850 | 75 | 47 | 67 | 42 | 2252 |
| | D | 2566 | 62 | 38 | | | |
| One hour dyeing without protective colloid | A | 1825 | 74 | 48 | | | |
| | B | 1413 | 76 | 48 | | | |
| | C | 1208 | 80 | 52 | 77 | 49 | 1488 |
| | D | 1506 | 78 | 50 | | | |
| Two hour dyeing with colloid..... | A | 1986 | 75 | 48 | | | |
| | B | 2246 | 68 | 42 | | | |
| | C | 1565 | 78 | 52 | 74 | 47 | 1918 |
| | D | 1878 | 74 | 48 | | | |
| Two hour dyeing without colloid..... | A | 984 | 80 | 64 | | | |
| | B | 1042 | 78 | 68 | | | |
| | C | 1122 | 79 | 68 | 79 | 65 | 1010 |
| | D | 895 | 82 | 70 | | | |
| Three hour dyeing with colloid..... | A | 1232 | 74 | 49 | | | |
| | B | 952 | 78 | 51 | | | |
| | C | 1340 | 72 | 50 | 74 | 49 | 1159 |
| | D | 1112 | 71 | 48 | | | |
| Three hour dyeing without colloid..... | A | 662 | 84 | 56 | | | |
| | B | 341 | 88 | 61 | | | |
| | C | 820 | 81 | 68 | 85 | 64 | 519 |
| | D | 256 | 88 | 78 | | | |

tions, actually prevent the reduction. The samples I am showing you here, are quite interesting. They show the comparative effect of one of these products for a period of several hours.

## REDYEING

Notwithstanding all the processing the silk stockings get regularly, it is often found necessary to redye them. This means removal of transfers, finish, etc. There are available scouring compounds containing solvents whereby the dyer is enabled to remove the transfers at the same time he is scouring out the finish. Formerly, transfers were removed by hand spotting, that is, rubbing each transfer with a cloth or brush containing a solvent, such as Ether or Carbon Tetrachloride. This is time consuming and costly. The disadvantage was that the fabric was often roughened and the fumes objectionable. Treatment in the dyeing machines gives excellent results, even on those types of transfers classified as being indelible.

The following method has been used successfully in practice. Prepare the bath at 120 degrees Fahr., add 15 per cent to 25 per cent of the compounded solvent, based on the weight of the goods being processed, run 20 minutes, then raise temperature of the bath to 140 degrees Fahr., and run 20 minutes longer. Sample to determine if transfers are removed. Most transfers are removed at this stage, but if any are not removed, raise the temperature to 160 or 180 degrees Fahr., and run 20 minutes longer.

The more resistant transfers require the temperature to be brought to the boil, and kept at a slow boil for 20 minutes to assure their complete removal. Flush the bath over to remove insoluble matter. The level of the bath can then be lowered to the required mark and the stripping conducted in the same bath.

## STRIPPING

The use of protective colloids as previously mentioned is recommended together with a fairly high percentage of a high grade Sulfonated Oil, or the lubricating type of a Sulfonated Fatty Alcohol. The same protective and lubricating ingredients, of course, should be used in the redyeing, as it is impossible for the dyer to tell just what abuses in processing the stocking has had during the original dyeing.

**TABLE II**

| | *Stresses or Cycles* | *Load in Lbs.* 1st *Cycle* | 200th *Cycle* |
|---|---|---|---|
| Stripped with 5% Sodium Hydrosulfite .. 5% Protective Colloid | 750 | 72 | 45 |
| Stripped with Sodium Hydrosulfite Without Colloid .... | 115 | 92 | .. |

## FRAZIER TEST

The above table II shows Frazier results obtained with and without Protective Colloid in a stripping bath. Three per cent Protective Colloid and 5 per cent Sodium Hydrosulfite, based on the weight of the goods were used.

## FINISHING OF SILK HOSIERY

Gentlemen, apparently you believe from all the problems that I have discussed that there isn't any really good quality hosiery manufactured, but I am glad to say there is, thanks to wet finishing. Practically all hosiery is finished today, and finishes, especially those of the repellent type exert a rejuvenating effect on the silk.

Fashion demands spot proofing and dull tone, and often, a combination of these. Spot proof finishes coat the fiber with an elastic film, that reduces both internal and external friction. These finishes withstand 8 to 10 launderings without losing their effectiveness, thus, in finished hosiery, the consumer is actually getting a fabric that will wear, for the life of the fabric has been prolonged.

## QUALITIES OF REPELLENT FINISHES

To show the rejuvenating effect of various repellent finishes, we have boiled-off and dyed silk hosiery, intentionally damaging it, using a one bath method, in the

**TABLE III**

| *Stage of Processing* | *STOCKINGS* | *Stresses or Cycles* | *Loads in Lbs. at* 1st *Cycle* | *Cycle* 200th | *Average Loads* 1st *Cycle* | 200th *Cycle* | *Average Stresses or Cycles* |
|---|---|---|---|---|---|---|---|
| Direct from dye baths no finish..... | A | 34 | 85 | | | | |
| | B | 22 | 125 | | 105 | | 28 |
| Finish No. 1 ..... | A | 1846 | 60 | 50 | | | |
| | B | 2013 | 43 | 32 | 51 | 41 | 1928 |
| Finish No. 2 ..... | A | 178 | 77 | | | | |
| | B | 192 | 74 | | 75 | | 185 |
| Finish No. 3 ..... | A | 179 | 83 | | | | |
| | B | 73 | 96 | | 89 | | 126 |
| Finish No. 4 ..... | A | 2081 | 56 | 46 | | | |
| | B | 2748 | 46 | 34 | 51 | 40 | 2414 |
| Finish No. 5 ..... | A | 2214 | 44 | 36 | | | |
| | B | 2386 | 48 | 32 | 46 | 34 | 2300 |

presence of softened water with a pH 9, at the boil, 10 per cent of a sulfonated degumming oil, 3 per cent $Na_2CO_3$ all based on the weight of the hosiery.

Hosiery was dyed at the boil for a period of three hours, which resulted in alkaline damage to such an extent that they only ran an average of 28 cycles or stresses on the Frazier Machine.

These stockings were then treated with 10 per cent of the various water repellent compounds for 10 minutes, hydro extracted to 150 per cent moisture content, and dried on regular steam hosiery forms. The hosiery was then allowed to remain overnight to pick up its natural moisture.

### HOSIERY QUALITY BEFORE AND AFTER FINISHING

The following interesting Frazier Tests show the comparison before, and after finishing: (*See table III*).

Note carefully the load in pounds on the finished hose recorded at the first cycle and the reduction at the 200th cycle. This indicates the degree of elasticity and recoverability. Stockings will not become deformed or baggy as a result of stretching or wear if the load in pounds reduces considerably at 200 cycles.

It is also a known fact that all repellent finishes do not have the property to lubricate and reduce fraction, as is shown in Table by Finish No. 2 and No. 3, which have high loads and failed at 185 and 126 cycles respectively.

—♦♦—

# Wool-Lanital Blends*

**P. LAROSE†**

NOW that fabrics made of Lanital are a reality and have found their way into the Canadian market, it becomes important to have means of differentiating this fiber from wool and of determining it in mixtures with wool.

Lanital fibers are easily distinguished from wool fibers when examined under the microscope. The absence of scales and the presence of striations are sufficient to differentiate them from wool. Other characteristics will be found described in numerous articles on this fiber which have already appeared in the technical literature.

Although wool and lanital are easily distinguished qualitatively, the quantitative determination of the artificial casein fiber in mixtures with wool is fairly difficult due to the similar chemical properties possessed by the two types of fibers.

Since lanital was first developed in Italy, it is only natural to find that the first proposals made for its determination came from the same country.

A method proposed by R. Vaglio[1] consisted in treating the material to be analyzed with a boiling solution of caustic soda under certain definite conditions. The method was critically examined by E. Cozzola[2] and later by E. DaSchio[3] who proposed a modification of the method as giving better results.

The method given by DaSchio is as follows: The material is freed of all extraneous matter, such as sizing, filling, oil, etc. An extraction with ethyl ether followed by two washings with very dilute ammonia solution, then with water, is recommended for this purpose. After washing, the material is air dried. In testing yarn it is better to cut it into short pieces about 1 inch long, while in the case of cloth it should be ravelled off into the yarn and the latter cut as before into small pieces. A sample of about 2 gm. is weighed accurately and introduced into 100 cc. of a 20 per cent caustic soda solution, preheated to 30° C. It is kept at that temperature for 3 hours and frequently stirred. At the same time as the sample is weighed, another sample is taken, on which the moisture content is determined. After the three-hour treatment the solution is poured onto a 100-mesh screen or onto a porous glass filter and the material is washed, first with water, then with water slightly acidulated with acetic acid and again with water. The material is then dried at 105° C. The loss in weight is figured on the basis of the original dry material, the weight of which is easily calculated from the moisture content determined on the other sample. The loss in weight represents all the wool plus a certain percentage of the lanital which, under the conditions prescribed, DaSchio claims to be 12.3 per cent. The original dry weight of lanital is, therefore, $\frac{100}{87.7}$ that of the final dry weight. The difference between the initial dry weight of the material and this corrected weight represents the quantity of wool.

The loss of lanital on treatment with the caustic soda solution was found by DaSchio to depend on the temperature and on the time of treatment. With increasing time the lanital showed a progressive loss in weight as follows:

*Canadian Textile Journal.
†National Research Council, Ottawa

**TABLE I**

| *Time of Treatment—30° C* | *Loss in Weight* |
|---|---|
| 1 hr. | 7.7% |
| 2 | 10.4 |
| 3 | 13.3 |
| 4 | 15.4 |
| 5 | 18.5 |

The effect of temperature is shown by the following figures:

| *Temperature* | *Loss in Weight in 3 hrs.* |
|---|---|
| 20° C. | 8.2% |
| 30° C. | 12.0% |
| 40° C. | 22.0% |

The treatment at 30° C. for 3 hours was found necessary in order that all the wool may be dissolved. The 20 per cent strength of solution is also claimed to be the one which affects the solution of the wool most rapidly.

### Method Must be Modified for Newer Products

The author of this method strikes a cautious note, however, at the beginning of his paper and says that the method must not be considered as final. As a result of the changes and improvements which are being made in the lanital fibers with accompanying changes in its properties, it will probably be necessary to modify the method to suit the newer products. This point is well raised for the writer has tried the method on some lanital on hand and found a loss, on treatment with caustic soda solution, of about 50 per cent greater than that claimed by DaSchio. However, this material was probably much older than that used by DaSchio and would be expected to give different results.

It would nevertheless be preferable in carrying out the method, to run a blank at the same time and under the same conditions as the test piece by using a material known to be pure lanital and to make use of the loss suffered by it as a basis of the calculations made on the unknown sample.

### References


[1]R. Vaglio. Boll. Ass. Ital. Chimica Tessile e Coloristica, 1936, No. 6, p. 95.
[2]Egidio Cazzola. Boll. Ass. Ital. Chimica Tessile e Coloristica, 1936, No. 8, p. 127.
[3]E. DaSchio. Boll. Ass. Ital. Chimica Tessile e Coloristica, 1936, No. 12, p. 180.


# TRADE NOTES — NEW PRODUCTS

### • CALCO RELEASES

The Calco Chemical Company has just announced the addition to their line of 10 Calcoloid Vat Pastes for dyeing, to be followed later by additional types now in process.

These products have been developed to supplement the Calcoloid Vat Powders for dyeing in the mill, where the use of paste is preferred over powder.

### • MIXING EQUIPMENT CONFERENCE

The annual sales conference of representatives of the Mixing Equipment Company from the Northeastern Division was held on August 13th and 14th at the company plant in Rochester, N. Y., with more than a score of salesmen and executives in attendance. According to officials of the local company it was one of the most successful meetings held since the formation of the company in 1923.

Opening the two-day session, E. S. Bissell, Sales Manager extended the company's greeting to the assemblage and briefly outlined business to be discussed. Following speakers included Fred H. Gordon, Jr., President, Gordon L. Brown, Kyle A. Seabrooks, and S. C. Wagner.

**Executives of the Mixing Equipment Co., with sales representatives from Northeast Division at the Annual Sales Conference.**

One of the most interesting features of the meeting was a discussion by Mr. Bissell of Mixing Technology and Viscosity Measurements and a demonstration of several of the smaller units manufactured by the local firm. Paramount in interest, though, was the announcement by President Gordon of the new developments soon to be launched.

The sessions were concluded with a banquet at the Hotel Seneca during which Mr. Bissell presented the sales and advertising program for the coming year. Mr. Gordon wound up the evening with an outline of the present trends in the business.

All salesmen in attendance at the meeting were enthusiastic in their comments regarding the present line of mixing equipment manufactured by the Mixing Equipment Company and confident that the introduction of the new models would uncover still more laboratory and industrial uses for these mixers.

Mixing Equipment Company manufactures a complete line of mixing equipment for laboratory and industrial use in tanks and vats of all sizes. Their "Lightnin'" Mixers are said to be one of the most popular lines of mixers on the market.

### • STEIN HALL LABORATORY

Stein, Hall & Co., Inc. have established a new laboratory at Providence, R. I. fitted out with complete and modern equipment for the scientific solution of sizing, printing, and finishing problems.

The work will be in charge of Mr. F. G. LaPiana, assisted by Mr. David Truax: Mr. Frank W. Perry will be the resident chemist. All of these men have had a wide experience in the textile industry. Close liaison will be maintained with the main Stein Hall laboratories in New York.

The decision to open the new laboratory is in line with the Stein Hall policy of expanding its technical service. In the past, New England manufacturers have utilized the New York laboratory facilities, which are still available to them. However, it is felt that the establishment of a modern laboratory close at hand should prove of even greater value and convenience.

As prominent importers, distributors, and manufacturers of every type of starch material used in textile processing, Stein, Hall & Co. also maintain well-equipped laboratories at Long Island City, Charlotte, N. C., and Chicago.

The announcement was also made of a new and enlarged research program at New York laboratory. Mr. M. Cushing has been engaged as research chemist, and will devote his time exclusively to pure research in starch and dextrine chemistry, under the direction of G. V. Caesar, Laboratory Director.

"While an essential function of our laboratory," said Mr. Edwin Stein, Vice President, "is the solution of practical starch and dextrine problems, it is equally important to conduct a long-range program of scientific research into the fundamental nature and properties of starches and dextrines."

"Such modern miracles as the new synthetic resins, high-test steel alloys, and the development of uses for the photo-electric cell have been made possible only because the chemical, steel and electrical industries

were willing to devote millions of dollars and years of research to the study of fundamental problems. We believe that similar research in starch and dextrine chemistry will eventually contribute important results."

### • COAL-TAR DYE EXPORTS

American foreign trade in coal-tar products increased substantially during the first half of the current year and despite a 33 per cent gain in imports the United States maintained a favorable balance of trade of such finished products, according to C. C. Concannon, Chief of the Commerce Department's Chemical Division.

Prior to the World War the United States was almost entirely dependent upon foreign countries for its requirements of coal-tar medicinals, aromatics, dyes, and a number of other finished coal-tar products, he stated.

Total exports of American coal-tar products, both crude and refined, were valued at approximately $8,013,000 during the first half of the year against $7,425,000 in the corresponding months of 1936, according to preliminary statistics.

Shipments of finished products, including dyes, colors, stains, intermediates, rubber compounding agents and the like increased around 14 per cent compared with the first half of 1936, or from $4,985,000 to $5,697,000. In this classification dyes, colors, stains, etc., increased in value from $3,667,000 to $3,849,000, according to preliminary statistics, which show that while China, Canada, Japan, British India, Belgium, the Netherlands, Germany, Mexico, and Argentina are our outstanding markets for such products, shipments are now going forward regularly to more than fifty foreign countries, according to Mr. Concannon.

United States exports of coal-tar crudes declined somewhat during the first half of the year—the total aggregated $2,316,000 against $2,500,600 in the first six months of 1936—due to smaller shipments of crude coal-tar, pitch, and certain other crudes, statistics show.

Imports of coal-tar products into the United States were valued at $9,361,000 in the first half of the current year compared with $6,943,000 for the corresponding months of 1936. More than half the total consisted of cresote oil and other crudes, according to Mr. Concannon.

Receipts of finished products gained approximately 35 per cent in value during the current period compared with the first half of 1936, or from $3,581,000 to $4,813,000, with practically every major item making up the trade sharing in the gain, statistics show. In this classification imports of coal-tar dyes, colors, stains, and similar products increased from 1,604,000 to 1,860,500 pounds in quantity and in value from $2,315,000 to $2,890,000. Most of these items consisted of small-lot quantities of special lines and were supplied by Germany and Switzerland, according to Mr. Concannon.

Other coal-tar imports recording gains compared with the first half of 1936 included acids, receipts of which increased from 248,000 to 381,000 pounds; other intermediates, from 700,000 to 1,334,000 pounds; and medicinals, from 11,000 to 21,000 pounds, Commerce Department records show.

### • COLUMBIA TEXTILE COURSES

H. R. Mauersberger, director of Evening Textile Courses at Columbia University, announces the following scheduled courses and opening dates as follows for the Fall 1937 Winter Session:—

Textiles eZ3—Spinning and Weaving of Rayon and Other Synthetic Yarns and Fabrics. Thursdays, 7:30 to 9:20 p.m. Mr. H. R. Mauersberger. Begins September 23rd.

Textiles eZ1—Spinning and Weaving of Cotton. Mondays, 7:30 to 9:20 p.m. Mr. H. R. Mauersberger. Begins September 27th.

Textiles eZ9—Woolen and Worsted Manufacture. Mondays, 7:30 to 9:20 p.m. Mr. W. von Bergen. Begins September 27th.

Textiles eZ5—Woven and Printed Design. Tuesdays, 7:30 to 9:20 p.m. Mr. W. H. Arlt. Begins September 28th.

Textiles eZ7—Manufacture of Silks. Tuesdays, 7:30 to 9:20 p.m. Mr. M. Steiner. Begins September 28th.

Textiles eZ11—Identification, Analysis and Testing of Textiles. Wednesdays, 7:30 to 9:20 p.m. Mr. J. Giblin. Begins September 29th. (New course.)

All courses extend over 15 weeks. No special requirements demanded. Registration for the courses begins September 17th. Instructors can be consulted in Room 301, School of Business during registration period from 6-9 p.m., located at 116th Street and Broadway, New York. Direct inquiries to Registrar of Columbia University.

### • BOOK CATALOG

The 136 page spiral wire bound Catalog No. 4 listing and describing chemical, bacteriological, engineering, electrical and general scientific and other technical books of American and British publishers, offered to technical workers, by the Chemical Publishing Co. of N. Y., Inc., is said to have met with such a great demand that it is now out of print. Catalog No. 5 is now ready and will be mailed to any technical worker sending 10 cents in stamps or coin to cover mailing.

This catalog eliminates the necessity of filing and looking through catalogs of many technical publishers—thus saving a great deal of time and effort.

### • SEPTEMBER TEXTILE RESEARCH

The September number of *Textile Research*, official organ of U. S. Institute for Textile Research, publishes an "honor list" of the 46 financial sponsors of its research on textile drying that is now in progress at the National Bureau of Standards. It also reports a grant of $500 from the Corn Industries Research Foundation to its research on warp sizing which has been in progress at Massachusetts Institute of Technology since June, 1935. The following research reports of Textile Foundation Fellows appear in the same issue: X-ray Analysis of Textile Fibers, Part V. Relation of Orientation to Tensile Strength of Raw Cotton, by Wayne A. Sisson, and Microbiology of Textile Fibers, Part VI, Relative Humidity over Certain Aqueous Solutions of Glycerol at 25° C., by Bryce Prindle.

U. S. Institute's research on warp sizing and sizing materials, now in its third year, has received a grant of $500 from a manufacturers' association; no, not a textile manufacturers' association, but the Corn Industries Research Foundation, a research organization supported by all of that industry's leading manufacturers. The following four corn starch producers have been financial co-operators of the warp sizing study from its start in 1935: Corn Products Sales Co., Keever Starch Co., Penick & Ford, Ltd., and A. E. Staley Manufacturing Co. The other members of the Foundation are as follows: American Maize Products Co., Anheuser-Busch, Inc., Clinton Co., Hubinger Co., Huron Milling Co., Inc., Piel Bros. Starch Co., Union Starch & Refining Co. This appreciated grant followed an investigation of the status of the warp sizing study by the director of the Corn Industries Research Foundation.

A total of 50 sponsors at $100 each is needed to complete the financing of the project on drying research for its first year, but there is no limit to the number of co-operators and should sufficient additional funds be subscribed progress of the work may be aided materially. The first monthly progress report of the study, descriptive of special equipment designed for studying moisture relations of textile materials in air at different relative humidities at elevated temperatures, was mailed to co-operators last month. Future subscribers to the project will qualify to receive all progress reports. For full particulars regarding this research see the descriptive booklet, "Drying," copy of which may be had by addressing Secretary, U. S. Institute for Textile Research, 65 Franklin St., Boston, Mass.

### • PROCTER & GAMBLE CENTENNIAL

The completion of its first century of successful industrial pioneering is marked

by the Procter & Gamble Company, one of the largest manufacturers of soap and allied products in America, in calling public attention to its past history, and declaring that it faces the next hundred years with faith and confidence. There will be no special event to mark the centennial.

Just a hundred years ago this month William Procter, who made candles, and James Gamble, who made soap, decided that since the raw material for both businesses was similar, a partnership would be mutually advantageous. Procter had recently arrived from England and Gamble from Ireland, and they had married sisters.

With a single assistant, they began their business in a small shed in Cincinnati. At the start, the partners sold their products from door to door, trundling them through the streets in a wheelbarrow. From that first shed has developed the present Ivorydale plant, which until after the turn of the century, was the only plant of the firm. There are now additional plants at Kansas City, Kansas; Port Ivory, Staten Island, New York; St. Bernard, Ohio; St. Louis, Missouri; Baltimore, Maryland; Hamilton, Ontario; Macon, Georgia; and Dallas, Texas. Procter & Gamble also owns and operates many large cottonseed crushing mills throughout the cotton belt. Its foreign operations include plants in England, Cuba and the Philippines.

In 1890 the firm was incorporated under the laws of New Jersey. William A. Procter, son of the original William Procter, was elected first President of the corporation. In 1905, the company was re-incorporated under the laws of Ohio.

Procter & Gamble have always been prominent in chemical and industrial research and development. The first chemist moved into the Procter & Gamble factory even before the first advertisement of the company was run. The labor relations policy of the company, has from the start, been in the vanguard of American business. It was Procter & Gamble who pioneered in establishing harmonious working arrangements between employer and employee.

The famous Procter & Gamble trademark has an unusual history. One day a wharf-hand on Cincinnati's water front played idly with a brush and a can of ship's paint. He traced rough crosses for stars on the ends of the boxes of candles from the young firm of Procter & Gamble. So marked, the boxes travelled down the river to Louisville which, with Cincinnati itself, represented the entire compass of the Company's business in those days.

On the next shipment, the candle boxes did not carry the stars. They were refused by their purchaser as not being genuine. From then on the boxes were marked with stars. Then a crescent moon was added and so the Procter & Gamble trademark evolved.

The secret of success of the Procter & Gamble business is said to have been good value of the product; (2) mass production of sound advertising; (3) fair, four-square selling policies. Procter & Gamble was one of the earliest national advertisers in the country, running its first advertisement in 1892, featuring Ivory Soap in The Independent, a weekly magazine. From that day to this Procter & Gamble has been among the leading national advertisers in newspapers and magazines.

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### • HERCULES OFFICE

On August 1, 1937, Naval Stores Department of Hercules Powder Company opened an office in the Johnston Building, at Charlotte, N. C. The telephone number is 4918. Frank U. Rapp, with headquarters at the new office, is Hercules Powder Company's representative calling on Southern mills regarding Hercules naval stores products for the textile trade.

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### • GEIGY RELEASE

Geigy Company, Inc., 89 Barclay Street, New York City, announces release of the following shade card:—

*Dyestuffs for Acetate Rayon*—among the samples shown in this shade card are a number of standard dyeings; effect dyeings, including delustered viscose rayon with acetate rayon, wool with acetate rayon, real silk with acetate rayon; solid shades of viscose rayon and acetate rayon, wool and acetate rayon; and effects leaving acetate rayon white. Complete dyeing instructions are given to produce the various effects and patterns. There is also given a list of colors for use in dyeing all types of mixed fabrics containing acetate.

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### • HUNTER COUNSELOR

The September, 1937 issue of the *Hunter Counselor*, published by the James Hunter Machine Co., North Adams, Mass., has been recently distributed and appears in a new and colorful form. The new size is about 8½" by 10½" and the contents are presented in an attractive and readable manner The contents of this issue are as follows: Modern Tentering, High Speed Stock Drying, The Art of Making Fabrics of Distinction, Better Wool Scouring and An Opportunity to Get Up-to-date Equipment Data. Copies of this publication are available upon request.

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### • ELECTED VICE-PRESIDENT

Robert A. Bruce was recently elected vice-president of the W. H. & F. Jordan, Jr., Mfg. Co., Philadelphia, Pa. Mr. Bruce has been in the employ of the Jordan organization for over six years, the last two

of which were spent as manager of the company's southern branch with headquarters at 902 Fairmount St., Greensboro, N. C. Previously he had spent over 10 years in the dyeing of yarn, hosiery and piece goods and thus he brought to this company a broad practical knowledge. Mr. Bruce has been active in the affairs of the American Association of Textile Chemists and Colorists and was at one time an officer of the Philadelphia Section.

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### • GENERAL RELEASES

General Dyestuff Corp., 435 Hudson Street, New York City, announces release of circulars on the following new products:

*Direct Fast Orange M R Conc.*—a direct color producing on cotton and rayon bright orange shades said to possess good fastness to light and washing. The product is particularly recommended by the manufacturers as a speck dyeing color since it leaves wool practically clear. Circular G-159.

*Celliton Discharge Blue 5G*—a very bright blue dyestuff for acetate which is said to be dischargeable to a pure white. It is said to be well suited for the production of all types of blue shades and also for greens in conjunction with Celliton Discharge Yellow 5 G, 3 G N or G L. It is stated that it can also be used as a combination dyestuff for dischargeable brown and black shades. Circular I. G. 1328.

*Diazo Fast Bordeaux B B L A*—when diazotized and developed with Developer A is said to produce on cotton and rayon full shades of a bright bluish red which can be easily discharged to a very clear white. Circular G 160.

*Fastusol Green L G T*—producing a full green shade said to be of very good fastness to light. For a direct dyestuff, it is claimed to be remarkably fast to water, washing and perspiration. Circular I. G. 1345.

*Mordant Yellow O D*—a new chrome yellow which may be dyed chrome-topped, chromate or a chrome mordant and produces bright, reddish yellow shades said to possess very good fastness properties. Dyed according to the silk white method, it is said to exhaust very well and to leave

silk effects clean. It is stated that this product is of good solubility, is not precipitated by acid, and is suitable therefore for machine dyeing. Circular G 162.

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**• IMPREGNOLE PROMOTION**

Mr. Ernest Nathan, President of the Warwick Chemical Company, 580 Fifth Avenue, New York City, announces the engagement of Miss Diana Johns as fashion and promotion director for Impregnole Process, a water repellent and stain, spot and perspiration resistant finish for fabrics of all kinds.

Miss Johns will work with Mr. Harold W. Rose, General Sales Manager of the Impregnole Division of the Warwick Chemical Company.

This division is removing to enlarged office quarters within the next few weeks to meet the needs of expanding business.

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**• HERCULES DECLARES DIVIDEND**

At the regular meeting of the Board of Directors of Hercules Powder Company on August 25th, a quarterly dividend of $1.50 a share was declared on the company's outstanding common shares. This dividend is payable on September 25, to stockholders of record at 3:00 p. m., September 14.

As previously announced by the company, it is also expected that stockholders of record at 3:00 p. m. on September 14 will be offered rights to subscribe, at $75 a share, to additional shares of the company's common stock in the ratio of one such share for each ten shares then held. These rights will be exercisable on or before October 14, 1937. Shares subscribed for under this offer will not participate in the September 25th dividend.

**• PHOENIX RELEASES**

Phoenix Color & Chemical Co., 24 Van Houten Street, Paterson, N. J., announces release of the following new products:—

*Phenacyl Navy Blue P V*—a direct dyeing navy blue for cellulose acetate which dyes best at a temperature ranging from 170-190° F. It is recommended by the manufacturers for all forms of box dyeing but not for jigs. It is claimed to be entirely satisfactory in its all around fastness properties, especially to light and washing. It is further said to hold its shade well under artificial light and not to crock even when dyed in heavy shades.

*Phenacyl Bordeaux Conc.*—believed by the manufacturers to be the bluest and brightest bordeaux shade on the market. It is said to be very soluble making it suitable for dyeing tightly twisted crepes or satins and taffetas in the jig. It is stated that this color can be dissolved by pasting up with a small amount of hot water and then diluting with boiling water. Its all around fastness properties, including light, perspiration, sea water, washing, etc. are claimed to be very good.

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**• SODIUM PERBORATE BOOKLET**

The R & H Chemicals Department, E. I. duPont de Nemours & Co., Inc., Wilmington, Del., has recently issued a booklet on the use of sodium perborate in developing full color values in vat dyes. Operation methods of vat dyeing for cottons, rayon and silk, and wool are discussed. The use of duPont sodium perborate as an oxidizing agent for "fixing" vat colors (except in the case of wool dyeing where hydrogen peroxide is usually recommended) is said to be preferred. duPont sodium perborate is a white powder containing 10 per cent + available active oxygen, moderately soluble in water but said to dissolve readily in acid solution, to be stable at ordinary temperatures and to keep in good condition if stored in closed containers in a cool, dry place. Copies of this booklet are available upon request.

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**• GAS MASK**

Acme Protection Equipment Co., Inc., Koppers Building, Pittsburgh, Pa., announces production of Acme Full Vision Gas Masks for industrial protection. It is stated that when equipped with the proper Acme Canister, they will afford full protection against individual, industrial and chemical gases or combinations of gases, smokes, fumes and dusts in all atmospheres

containing sufficient oxygen. It is claimed that because of unlimited vision the wearer will be able to see as well as when a mask is not worn. Complete details of construction and use will be supplied on request.

## CLASSIFIED

**The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.**

POSITION WANTED: Experienced Dyestuff Salesman Demonstrator desires connection. Now employed. Will go anywhere or would consider taking charge of dyehouse. Solicits inquiries. Write Box No. 967, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Chemist to supervise the preparation, dyeing, finishing of rayon, acetate, silk, cotton fabrics, the chemical control, research, improvements and economy. Experience with leading dyeing, printing and finishing organizations. Write Box No. 970, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Dyer and color chemist, thirty-seven years old, married. Nineteen years experience. Familiar with yarns in warp, skein or package, raw stock, hosiery, cotton, rayon and acetate piece goods. All types of union work, solid and multicolor. Several years full charge laboratory and dyeing department. Write Box No. 972, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Fully experienced dyer cotton piece goods. State age, complete experience and salary expected first letter. Applications confidential. Write Box No. 976, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

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